40 Rock ©

POPULAR Computing WEEKLY

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This Week

Vic20 software
Gary Thorogood attempts to solve a jigsaw and navigate one of the most hazardous rivers in the world in this latest selection of Vic20 games See page 16

Machine code
Trevor Toms looks at the use of arithmetic in Spectrum machine code in the first of a six part series starting on page 23.

ZX81 programming
Andy Wilson introduces structured programming to the ZX81 and explains how programs can be more readable See page 19

New releases
All the latest software games including *Munnery's Mergatroids* and *Pawn Chess* See page 68

★ STAR GAME ★
Pacman on Dragon. See Page 10

News Desk

Hungarian dancing monster

COMMODORE'S highly original game *Dancing Monster* for the Commodore 64 is one of the first programs to appear from the rapidly growing Hungarian software industry

Caesar the Cat the recent Mirrorsoft release for the same computer is another Hungarian program

These two games were among a wide range of computer programs demonstrated at the Hungarian Trade Commission between November 14 and 16 Nine companies were represented at the show — the first exhibition of software by an eastern bloc company to be held in the UK

According to the Commission's Benedek Tillai, there are now many computer clubs in Hungary and the Commodore 64 and Vic-20 machines are especially popular

Novotrade is the most prolific games house in Hungary, responsible for both *Caesar the Cat* and *Dancing Monster* Based in

Continued on page 5

Softswitch taken off the market

SALES of the controversial Softswitch add-on for the Vic20 micro are to be discontinued

The product, sold by the General Hardware Company allows protected Rom cartridge software for the Commodore Vic20 to be broken into and saved out to tape

When announced (see *Popular Computing Weekly* July 14) a number of companies including Commodore Thorn EMI and Audiogenic condemned the £19 95 Softswitch as an invitation to pirate commercial software

A hearing before Justice Harman was scheduled to take place on November 29 But under threat of an injunction the General Hardware Company has agreed to stop making the Softswitch in return for Commodore dropping the case

Ironically even before Commodore's writ the General Hardware Company had decided to withdraw the Softswitch from circulation

Continued on page 61

BRITAIN'S BEST-SELLING MICRO WEEKLY



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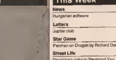
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This Week



Editorial

Selling micros to the third world appears to be in vogue at the moment. No sooner had Sinclair announced plans to set up pilot production lines for the manufacture of the ZX81 and Spectrum in China than Acorn revealed its intention to do the same in India.

At first sight, this appears a logical strategy to undertake. Setting up production lines in the third world could substantially lengthen the life of micros which tend to become obsolete within three years of launch. Also, the third world could provide continuing markets for both software and peripherals already developed in the UK and elsewhere.

However, this strategy depends on the third world countries producing and using micros internally. If production lines are set up, but the resulting micros merely exported back to the developed countries of the west, there will be no expansion in the number of end-users, only increased competition among manufacturers.

The indigenous populations of both China and India are extremely poor. Without government aid, only a tiny percentage would be able to afford to buy micros, never mind the televisions needed to act as visual display units.

The third world obviously represents a huge untapped market, but that market may be more apparent than real.

Next Thursday

Can you find the hidden treasure and avoid the Octopus? Find out in Diver, next week's Star Game for the Spectrum by John Durat

BBC in Indian takeaway

THE Indian Government has selected the BBC micro for use in its school and university computer education programme

Chris Curry — looking for an Indian summer

An initial order has been placed for the Acorn machine worth over £½m. Thirty machines — in the form of five six station Econet systems — have been presented to the Indian President Zail Singh by the Queen during her state visit to the country last week

Part of the agreement between the Indian Government and Acorn means that a proportion of the BBC machines used in Indian schools and colleges must be manufactured in India

Acorn's managing director Chris Curry is at present in India, negotiating with a number of manufacturing companies to assemble the BBC micro in India

Wongs go public

WONGS, the Hong Kong-based manufacturers of the Atari, Acorn, Coleco, IBM Apple and Texas computers, is to go public later this month (see page 15)

Twenty-five percent of the company's shares will be floated on the Hong Kong stock exchange, with dealing beginning on December 15

The underwritten issue of shares worth HK$176 25m (£15 1m) values the whole company at HK$705m (£60 4m) Profits this year are expected to top HK$75m

Dragon turns turtle

SALAMANDER is in the final stages of developing a Turtle graphics utility package for the Dragon computer

The program will be supplied both on cassette and on disc, configured for either the Delta or Dragon disc systems

It will include all the usual Turtle graphics commands including forward backward, left, right as well as extensive library and sub-string handling facilities Finished shapes can then be stored or combined with other existing designs

The package will also be compatible with the Oric and Tandy four-colour printers

The Salamander Turtle graphics package will be available in January, at a price expected to be around £14

Hungarian software

Continued from page 1

Budapest and backed by the three largest Hungarian banks, Novotrade works in close association with a UK company, Andromeda Software Andromeda's Robert Stein, himself Hungarian born explained that the company is at present producing 12 titles every two months which are licenced exclusively to Andromeda All the titles are written first for the Commodore 64 before being converted to the Spectrum and BBC machines

As well as writing material for Commodore and Mirrorsoft Novotrade has done work for Parker Brothers, Spectravideo CBS and arcade house Taitel

Much interest was shown in the Novotrade software shown at the exhibition, because of its original on-screen presentation Says Robert Stein Being Hungarian the games appear refreshingly different ' Commodore s software manager Gail Wellington, commented "*Dancing Monster* is very good graphically particularly in the way the main figure turns '

All of the programs are written by freelance programmers employed by Novotrade, working from ideas developed jointly by Novotrade and Andromeda

Nearly all of the titles shown at the exhibition have now been sold, and a number of companies including Commodore, Mirrorsoft, Virgin, Thorn EMI, Visions and Intelligent Software (the latter on behalf of Elan) have expressed interest

Micronet adaptor for ZX81

THE Prestel and Micronet 800 telephone database systems can now be accessed by ZX81 owners using a new low-cost adaptor from Microcomputer Resources

The unit is designed to be used in conjunction with any modem which works using the 300/300 baud full duplex or 1200/75 baud standards

The adaptor is about the same size as a Ram pack and plugs into the expansion port on the ZX81 It, in turn, provides an expansion port to allow a Ram pack or printer to still be connected

As well as interfacing to a modem, the device contains the software necessary to produce the 40 x 24 character Prestel format display in upper and lower case on the ZX81

Using Prestel's Mailbox facility Prestel pages can be down-loaded and saved to tape Software can also be down-loaded and run Programs not written in ZX81 Basic can still be down-loaded and the software in the adaptor picks out the program lines with incorrect syntax and reads them into the ZX81 as *Rem* statements which can then be edited or rewritten

The price of the adaptor is £29 95 A compatible modem by Prism is priced at £69 95 Both are available from Microcomputer Resources, 1 Branch Road, Park Street, St Albans, Herts

Oric disc drive from ITL



THE Byte Drive 500 disc drive for the Oric 1 has now been officially launched (see Popular Computing Weekly, *November 24)*

A complete system for the Oric including interface, 3 inch disc drive, power supply and disc operating system software is priced at £299 The package will be available in early January

ITL, the company which has produced the Byte Drive 500, is now working to make versions compatible with other home micros The company plans to produce interfaces which will enable the disc system to work with the Dragon, Commodore 64 and Spectrum computers all available in Spring 1984

New software at northern show

SOFTWARE provided most of the interest for visitors to the Northern Computer Fair held at Manchester's Belle Vue last week, 24 to 26 November

Only two computer manufacturers took the trouble to attend — Oric and Camputers with the latter showing its new 128K Lynx running the CP/M disc operating system

New Commodore 64 software predominated, with all the major software houses producing something for the machine Quicksilva showed an impressive music program — *Ultisynth 64*, which is expected to retail for £14 95 *Twin Kingdom Valley* from Bug-Byte is a new graphic adventure for both the Commodore 64 and BBC computers The program is in the *Hobbit* mould with 175 screens

Bug Byte also showed its *Manic Miner* follow-up, *Birds and Bees*, a multi level maze game for the 48K Spectrum

ZX Microfair

THE Ninth ZX Fair will be held this coming weekend, December 3 and 4

The venue is the Alexandra Pavilion, Alexandra Palace, London N22 the show is open from 10 am to 6 pm on Saturday and from 10 30 am to 4 30 pm on Sunday, and entry is £1 and 50p

THE DAN DIAMOND TRILOGY

My name is Diamond, Dan Diamond,

and this is my story. A story of beautiful mermaids, bored robots and dank, dark dungeons. A story that started one muggy day in New York, and like the Big Apple, it's rotten to the core.

The Dan Diamond Trilogy is three separate adventure games. Each game may be played on its own, but clues may be found in the earlier adventures which may help later on. Each game comes with a lavishly illustrated 20-page case file, and hints (both helpful and misleading) which have been hidden in the illustrations.

Part I. Franklin's Tomb, in which our hero receives a mysterious plea for help which leads him to a hidden tomb and the mystery of the stargate.

Part II. Lost in Space, in which our hero finds himself stranded on a derelict spacecraft, doomed to travel endlessly through space or find a way out.

Part III. Fishy Business, in which our hero lands on a watery planet, discovers the source of the plea for help and saves the day.



Ace users club

Having just read about the very unfortunate collapse of Jupiter Cantab I was prompted to write this letter

I feel that the machine has been greatly neglected in both the software and hardware areas I am therefore interested in starting up an Ace user's club

I have owned a ZX Spectrum for over a year, so I am not a newcomer to computing I think a club for this excellent little micro would be a good idea for both beginners and advanced programmers alike If the ZX-series should have a group, why not the Ace?

Anyone interested in either helping to run the club, or just becoming a member, should contact me at my address

Phil Murray
91 Killingworth Drive
High Barnes
Sunderland SR4 8QS

PS I will challenge anyone to beat me at Silversoft's brilliant *Orbiter* program

Lost name

Thank you for publishing *Draw a Circle* for the Dragon 32 (*PCW* 17-23 November) My friend and I are very grateful

Unfortunately, my friend Sean Jones' name was accidentally omitted from the article I would be very grateful if you could mention him in the letters section of your magazine

Sunil Singh
9 East Hills
Cranfield
Bedford

No major changes

With regard to the recent correspondence on the contents of *PCW* I hope that you will not consider any major changes What I particularly like is the mixture of news, serious and light-hearted articles Most other magazines are either wholly taken up with arcade games or else speak in great depth about machines which I cannot even afford to look at

On picking up *PCW*, I generally read the Automata page followed by Ziggurat (sorry about that, Ziggurat) Later on the puzzle generally comes in for scrutiny

By all means have an arcade corner, but please keep the balanced mixture which I've come to look forward to

John Alexander
9 Carlton Avenue
Rose Green
Bognor Regis
Sussex

Don't worry, we plan to keep the balance very much as it is

Infinite stripe

I am writing on the same theme as Martin Castree in Letters *PCW* 17-23 November, where he outlined two ways of getting high scores on the BBC model B

I have another method I think everyone should know about On Acornsoft's *Rocket Raid*, break the program and type in *Call&E100* The program will run again, but after the last ship has crashed, the game goes very slow After two minutes of this the game will come on again giving you an infinite number of ships

This will certainly get you a high score Another nail in the coffin for having high score tables

Scott Weir
42 Elie Avenue
Deans
Livingston
W Lothian

High taxation

Has anyone experienced problems with *Valhalla*? The problem I have found is this You ask Thor (or any other character) to buy a jewel for two crowns Thor accepts and you take 50 crowns

'Great,' you may say, 'the idiot has given me more than he should' However if you check what you are carrying (*List*) you will find that only one crown has found its way into your pocket Is this due to a fault in the program or is this the going rate of taxation in Asgard?

Mark Vass
Aldershot

This is not a problem I have come across, mainly because I spend most of my time in Valhalla either killing or being killed by the other characters. Perhaps some of our other readers can throw some light on the 'going rate of taxation in Asgard'

Screen copy

I am writing in response to Raymond Blake's letter in *PCW* 10-16 November, about proving high scores by a screen copy to a printer I have solved this problem to a certain extent for a 48K Spectrum

I tried a machine code routine which returned to Basic when a key was pressed whilst playing a machine code game This worked on some games, but more often crashed the computer So, I have now altered the routine so it immediately calls the Rom Copy routine directly when certain keys are pressed simultaneously

The way it works is to scan the keyboard every interrupt and if the correct keys are pressed then call the copy routine All this happens whilst you are playing your game However, there are a few drawbacks

1 The routine doesn't work on all programs

2 You need a 48K Spectrum and a printer to use it

3 The copy routine doesn't work with the bottom 2 lines so if the score is printed on these it will not be on the printout

But, apart from these, it does give you proof of a score on the games it works with

Use the loader to input the numbers in the right hand column, then save the code with

```
SAVE "COPY"CODE 65115 36
```

To use the routine, load it and type

```
RANDOMIZE USR 65115
```

then load your game If the routine works with the game, pressing *H* and *J* simultaneously will copy the screen I hope this program will be of use to you in authenticating scores

Karl Hampson
57 Harsnips
Birch Green
Skelmersdale
Lancs WN8 6QA

65115	60
65116	9
65117	237
65118	71
65119	237
65120	94
65121	201
65122	52
65123	62
65124	237
65125	71
65126	237
65127	56
65128	201
65129	255
65130	245
65131	197
65132	213
65133	229
65134	221
65135	229
65136	62
65137	191
65138	219
65139	254
65140	230
65141	24
65142	204
65143	172
65144	14
65145	221
65146	225
65147	225
65148	209
65149	193
65150	241
65151	251

LOADER

```
10 FOR A=65115 TO 65151 INPUT N.
POKE A,N PRINT A,N NEXT A
```

Munch Man

A new game for Dragon 32 by Richard Dodd

This program for the Dragon 32 computer is a version of *Pacman*. Using the four arrow keys you must steer your man round the maze avoiding the ghost and eating the dots. The ghosts will kill you if they get you unless you have eaten a power pill. When you have eaten a power pill a ghost will be printed in the top left-hand corner. All the time he is there you can eat the ghosts.

Program variables

LI = LIVES
LE = LEVEL
HI = HIGH SCORE
TF = TIME
U = UP CHARACTER
D = DOWN CHARACTER
L = LEFT CHARACTER
R = RIGHT CHARACTER
B = BLANK SPACE
G = GHOST
B1 = BLANK CHARACTER
B2 = DOT
B3 = POWER PILL
B4 = WALL
SC = SCREEN
P = ARRAY CONTAINING SCREEN
D = LOOP TO PRINT SCREEN
A = LOOP TO PRINT SCREEN
Q5 = POSITION OF CHARACTER TO BE POKED TO THE SCREEN
PR$ = LETTERS TO BE POKED
X = X POSITION OF MAN
Y = Y POSITION OF MAN
X1(0) = X POSITION OF GHOST 1
Y1(0) = Y POSITION OF GHOST 2
X2(1) = X POSITION OF GHOST 2
Y2(1) = Y POSITION OF GHOST 2
TL = TIME LEFT
BN = BONUS
S0 = SCORE FOR EACH LEVEL
PL = LOOP TO PLAY TUNE
A = CHARACTER GHOST IS OVER

Program notes

1	POKE TO SPEED PROGRAM UP
10-30	TITLES
70	DEFINES ALL VARIABLES
80-90	DIMENSIONS ARRAYS
110-150	READS DATA FOR CHARACTERS
180-270	GETS ALL CHARACTERS
290-370	CREATES SCREEN
380	GET WHOLE SCREEN
400-420	PRINTS SCORES
430	PRINTS HIGH RESOLUTION SCREEN
440	SETS POSITION OF GHOSTS AND MAN
460	STARTS MAN GOING LEFT
470	INPUTS DIRECTION AND ADDS 1 TO TIME
480	CHECKS TIME
490	CHECKS TO SEE IF YOU HAVE ENTERED TUNNEL
510-520	CHECKS TO SEE IF GHOST HAS EATEN THE MAN
530	CHECKS THAT THERE ARE DOTS LEFT
500	BLANKS OUT MAN
560-590	MOVES PLAYER IF A WALL ISN'T IN THE WAY
600	CHECKS TO SEE IF YOU HAVE EATEN A DOT
610	CHECKS TO SEE IF YOU HAVE EATEN A PILL
630-710	MOVES GHOST 1
730-800	MOVES GHOST 2
820-1450	DATA FOR CHARACTERS
1470-1610	DATA FOR MAZE
1650-1700	POKES CHARACTERS TO SCREEN
1740	PLAYS TUNE IF PLAYERS EATEN
1770	TAKES A LIFE OFF
1780-1880	BLANKS OUT GHOSTS AND MAN
1890	CHECKS TO SEE IF YOU HAVE ANY LIVES LEFT
1921	PRINTS SPACE IN THE MIDDLE OF THE SCREEN
1930	PRINTS GAME OVER
1960-2000	ASKS IF YOU WANT ANOTHER GAME
2030	RESETS ALL VARIABLES
2080-2100	PLAYS TUNE IF YOU GET ONTO A NEW LEVEL
2110-2180	REPLACES MAZE
2130	UP DATES SCORES
2180	BLANKS PLAYER OUT AS HE ENTERS TUNNEL
2190	CHECKS TO SEE WHICH WAY THE PLAYER HAS GONE
2200	PRINTS PLAYER ON THE OTHER SIDE
2250	PRINTS GHOST IN TOP CORNER IF YOU HAVE EATEN A POWER PILL
2300	BLANKS OUT GHOST
2310	PLAYS TUNE
2330	RETURNS GHOST TO CENTRE
2350	ADDS 20 TO SCORE
2390-2460	RESETS THE MAZE

```
1 POKE 65495,0
10 REM ************************
20 REM *   MUNCH MAN ???      *
30 REM ************************
35 PMODE 4:PCLS:SCREEN 1,1
40 CLS:PRINT @ 231,"PREPARING SCREEN"
50 SCREEN 0,1
60 REM *****VARIABLES*********
70 LI=3:LE=1:HI=200:TF=.2
80 DIM U(2),D(2),L(2),R(2),B(2),G(2),B1(2),B2(2),B3(2),B4
(2),SC(1000)
90 DIM A(90,7),P(31,15),X1(1),Y1(1)
100 REM **READ DATA FOR LETTERS**
110 FOR CH=32 TO 90
120 FOR I=0 TO 7
130 READ A(CH,I)
140 NEXT I
150 NEXT
170 REM ***GET USER DEFINABLES***
180 PR$=" ":GOSUB 1650:GET(0,0)-(7,7),B
190 PR$=CHR$(34):GOSUB 1650:GET(0,0)-(7,7),L
200 PR$="!":GOSUB 1650:GET(0,0)-(7,7),R
210 PR$="#":GOSUB 1650:GET(0,0)-(7,7),U
220 PR$="@":GOSUB 1650:GET(0,0)-(7,7),D
230 PR$="%":GOSUB 1650:GET(0,0)-(7,7),G
240 PR$=" ":GOSUB 1630:GET(0,0)-(7,7),B1
250 PR$=".":GOSUB 1650:GET(0,0)-(7,7),B2
260 PR$="$":GOSUB 1650:GET(0,0)-(7,7),B3
270 PR$="&":GOSUB 1650:GET(0,0)-(7,7),B4
280 REM ***CREATE SCREEN***
290 FOR D=0 TO 14
300 FOR A=0 TO 30
310 READ A$
320 IF A$="&" THEN P(A,D)=1:PUT(A*8,D*8)-((A*8)+7,(D*8)+7
),B4
330 IF A$="$" THEN P(A,D)=4:PUT(A*8,D*8)-((A*8)+7,(D*8)+7
),B3
340 IF A$="." THEN P(A,D)=0:PUT(A*8,D*8)-((A*8)+7,(D*8)+7
),B2
350 IF A$="" THEN P(A,D)=5
360 NEXT A
370 NEXT D
380 GET(0,0)-(240,120),SC
390 REM ***SCORES***
400 Q5=4320:PR$=STR$(HI)+" = HIGH SCORE  SCORE ="+STR$
(SC+BN):GOSUB 1630
410 Q5=4863:PR$="LEVEL = "+STR$(LE):GOSUB 1630
411 Q5=3869:PR$="TIME":GOSUB 1630
412 Q5=3909:PR$="END":GOSUB 1630
420 Q5=5354:PR$="LIVES = "+STRING$(LI,33):GOSUB 1630
430 PMODE 4:SCREEN 1,1
440 X=8:Y=7:X1(0)=3:Y1(0)=1:X1(1)=9:Y1(1)=13
450 B$=CHR$(8):GOTO 510
460 REM ***START OF GAME***
470 A$=INKEY$:TL=TL+TF:IF A$="" THEN 485
480 B$=A$
485 PSET(50+TL,125)
490 IF TL>140 THEN TL=0:LINE(50,125)-(190,125),PSET:GOTO
1740
490 IF P(X,Y)=5 THEN GOSUB 2180
500 IF GH$="E" AND TIMER>701 THEN GH$="":PUT(0,0)-(7,7),B4
510 IF X1(1)=X AND Y1(1)=Y AND GH$<>"E" THEN 1740 ELSE
IF X1(1)=X AND Y1(1)=Y THEN E=1:GOSUB 2290
520 IF X1(0)=X AND Y1(0)=Y AND GH$<>"E" THEN 1740 ELSE
IF X1(0)=X AND Y1(0)=Y THEN E=0:GOSUB 2290
530 IF SC>=(266+S0) THEN GOTO 2080
540 PUT(X*8,Y*8)-((X*8)+7,(Y*8)+7),B1
550 PUT(X*8,Y*8)-((X*8)+7,(Y*8)+7),B
560 IF B$=CHR$(9) AND P(X+1,Y)<>1 THEN X=X+1:PUT(X*8,Y*
8)-((X*8)+7,(Y*8)+7),R
570 IF B$=CHR$(8) AND P(X-1,Y)<>1 THEN X=X-1:PUT(X*8,Y*
8)-((X*8)+7,(Y*8)+7),L
580 IF B$=CHR$(94) AND P(X,Y-1)<>1 THEN Y=Y-1:PUT(X*8,
Y*8)-((X*8)+7,(Y*8)+7),D
590 IF B$=CHR$(10) AND P(X,Y+1)<>1 THEN Y=Y+1:PUT(X*8,
Y*8)-((X*8)+7,(Y*8)+7),U
600 IF P(X,Y)=0 THEN P(X,Y)=2:SC=SC+1
610 IF P(X,Y)=4 THEN PLAY"T100ABCDEFG":GOSUB 2250:P(X,Y)=6
:SC=SC+10
620 REM ***MOVE GHOSTS***
630 X1=X1(0):Y1=Y1(0)
640 PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),B
```

```
630 IF P(X1,Y1)=0 THEN PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7)
,B ELSE IF P(X1,Y1)=4
THEN PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),B2
660 IF X1>X AND P(X1-1,Y1)<>1 THEN X1=X1-1:GOTO 700
670 IF Y1<Y AND P(X1,Y1+1)<>1 THEN Y1=Y1+1:GOTO 700
680 IF Y1>Y AND P(X1,Y1-1)<>1 THEN Y1=Y1-1:GOTO 700
690 IF X1<X AND P(X1+1,Y1)<>1 THEN X1=X1+1
700 PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),G
710 X1(0)=X1:Y1(0)=Y1
720 X1=X1(1):Y1=Y1(1)
730 PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),B
740 IF P(X1,Y1)=0 THEN PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),
B2 ELSE IF P(X1,Y1)=4
THEN PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),B3
750 IF Y1<Y AND P(X1,Y1+1)<>1 THEN Y1=Y1+1:GOTO 790
760 IF X1<X AND P(X1+1,Y1)<>1 THEN X1=X1+1:GOTO 790
770 IF X1>X AND P(X1-1,Y1)<>1 THEN X1=X1-1:GOTO 790
780 IF Y1>Y AND P(X1,Y1-1)<>1 THEN Y1=Y1-1
790 PUT(X1*8,Y1*8)-((X1*8)+7,(Y1*8)+7),G
800 X1(1)=X1:Y1(1)=Y1
810 GOTO 560
820 REM ***DATA FOR LETTERS***
830 DATA 0,0,0,0,0,0,0,0
840 DATA 28,127,120,240,240,126,127,28
850 DATA 56,254,120,15,15,120,254,56
860 DATA 24,126,255,231,231,102,102,60
870 DATA 60,102,102,231,231,255,126,24
880 DATA 60,126,255,153,153,153,255,153
890 DATA 255,231,129,129,129,195,231,255
900 DATA 24,126,255,255,255,255,126,24
910 DATA 16,32,64,64,64,32,16,0
920 DATA 8,4,2,2,2,4,8,0
930 DATA 0,42,28,0,28,42,0,0
940 DATA 0,8,8,62,8,8,0,0
950 DATA 0,0,0,0,0,0,16,0
960 DATA 0,0,0,62,0,0,0,0
970 DATA 0,0,0,24,24,0,0,0
980 DATA 0,2,4,8,16,32,64,0
990 DATA 28,34,38,42,50,34,28,0
1000 DATA 8,24,8,8,8,8,28,0
1010 DATA 56,68,4,24,32,64,124,0
1020 DATA 28,34,2,12,2,34,28,0
1030 DATA 4,12,20,36,62,4,4,0
1040 DATA 62,32,60,2,2,34,28,0
1050 DATA 14,16,32,60,34,34,28,0
1060 DATA 62,2,4,8,16,32,32,0
1070 DATA 28,34,34,28,34,34,28,0
1080 DATA 28,34,34,30,2,4,56,0
1090 DATA 0,0,8,0,0,8,0,0
1100 DATA 0,0,8,0,0,8,16,0
1110 DATA 2,4,8,16,8,4,2,0
1120 DATA 0,0,62,0,62,0,0,0
1130 DATA 32,16,8,4,8,16,32,0
1140 DATA 28,34,4,8,8,0,8,0
1150 DATA 28,34,42,58,26,2,60,0
1160 DATA 28,34,34,62,34,34,34,0
1170 DATA 60,34,34,60,34,34,60,0
1180 DATA 28,34,32,32,32,34,28,0
1190 DATA 112,72,68,68,68,72,112,0
1200 DATA 124,64,64,120,64,64,124,0
1210 DATA 124,64,64,120,64,64,64,0
1220 DATA 30,32,32,32,38,34,30,0
1230 DATA 34,34,34,62,34,34,34,0
1240 DATA 28,8,8,8,8,8,28,0
1250 DATA 2,2,2,2,2,34,28,0
1260 DATA 34,36,40,48,40,36,34,0
1270 DATA 32,32,32,32,32,32,62,0
1280 DATA 34,54,42,42,34,34,34,0
1290 DATA 34,34,50,42,38,34,34,0
1300 DATA 28,34,34,34,34,34,28,0
1310 DATA 60,34,34,60,32,32,32,0
1320 DATA 28,34,34,34,42,36,26,0
1330 DATA 60,34,34,60,40,36,34,0
1340 DATA 28,34,32,28,2,34,28,0
1350 DATA 62,8,8,8,8,8,8,0
1360 DATA 34,34,34,34,34,34,28,0
1370 DATA 34,34,34,20,20,8,8,0
1380 DATA 34,34,34,42,42,54,34,0
1390 DATA 34,34,20,8,20,34,34,0
1400 DATA 34,34,20,8,8,8,8,0
1410 DATA 62,2,4,8,16,32,62,0
1420 DATA 126,96,96,96,96,96,126,0
1430 DATA 0,28,42,8,8,8,8,0
1440 DATA 62,6,6,6,6,6,62,0
1450 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1460 REM ******MAZE*******
1470 DATA &,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&
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1580 DATA &, &, ........ ,.........
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1590 DATA &, &, &,&,&,&,&,.,&,&,&,&,.,& ,&,&,&,&,.,&,&
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1600 DATA &,&,. , ........
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1610 DATA &,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&,&
,&,&,&,&,&,&,&
1620 REM *****************
1630 REM *  POKE LETTERS  *
1640 REM *****************
1650 FOR Q1=1 TO LEN(PR$)
1660 Q1$=MID$(PR$,Q1,1)
1670 IF Q1$=" " THEN 1680 ELSE Q2=ASC(Q1$)
1680 POKE (1536+Q5+(Q1-1))+Q4*32,A(Q2,Q4)
1690 Q3=Q3+1:Q4=Q4+1:IF Q4>7 THEN Q4=0:NEXT Q1 ELSE GOTO
1680
1700 RETURN
1710 REM *****************
1720 REM *  PLAYER EATEN  *
1730 REM *****************
1740 FOR DE=1 TO 5
1750 PLAY"T100ABCDEFGABCDEFGABCDEFG"
1760 NEXT
1770 LI=LI-1
1780 A=P(X,Y):A1=X:A2=Y:GOSUB 1820
1790 A=P(X1(0),Y1(0)):A1=X1(0):A2=Y1(0):GOSUB 1820
1800 A=P(X1(1),Y1(1)):A1=X1(1):A2=Y1(1):GOSUB 1820
1810 GOTO 1860
1820 IF A=2 THEN PUT(A1*8,A2*8)-((A1*8)+7,(A2*8)+7),B
1830 IF A=4 THEN PUT(A1*8,A2*8)-((A1*8)+7,(A2*8)+7),B3
1840 IF A=0 THEN PUT(A1*8,A2*8)-((A1*8)+7,(A2*8)+7),B2
1850 RETURN
1860 Q5=4346:PR$=STR$(SC+BN):GOSUB 1650
1870 Q5=5362:PR$="    ":GOSUB 1650
1880 Q5=5363:PR$=STRING$(LI,37):GOSUB 1650
1890 IF LI<>0 THEN 440
1900 REM *****************
1910 REM *  END OF GAME  *
1920 REM *****************
1921 LINE(80,40)-(180,72),PRESET,BF
1930 Q5=1033:PR$="GAME OVER":GOSUB 1650
1940 FOR PA=1 TO 1000:NEXT PA
1950 CLS
1960 PRINT @ 106,"GAME OVER"
1970 IF SC+BN>HI THEN HI=SC+BN+00:PRINT @ 193,"WELL DONE
NEW HIGH SCORE"
1980 PRINT @ 326,"ANOTHER GAME (Y/N)"
1990 A$=INKEY$:IF A$="" THEN 1990
2000 IF A$="N" THEN END
2010 PMODE 4:PCLS:SCREEN 1,1
2020 GOSUB 2360
2030 SC=0:LI=3:BN=0:00=0:TF=.2:TL=0:LE=0
2040 GOTO 480
2050 REM *****************
2060 REM *  NEW LEVEL  *
2070 REM *****************
2080 FOR PL=1 TO 5
2090 PLAY"T255ABCDEFGABCDEFGABCDEFG"
2100 NEXT PL
2110 PCLS:PUT(0,0)-(240,120),SC
2120 GOSUB 2360
2130 LE=LE+1:00=00+265:TF=TF-.1:TL=0
2140 GOTO 480
2150 REM ************
2160 REM *  TUNNEL  *
2170 REM ************
2180 PUT(X*8,Y*8)-((X*8)+7,(Y*8)+7),B
2190 IF X<=1 THEN X=29 ELSE X=1
2200 PUT(X*8,Y*8)-((X*8)+7,(Y*8)+7),B1
2210 RETURN
2220 REM **************
2230 REM * POWER PILL *
2240 REM **************
2250 PUT(0,0)-(7,7),G:TIMER=0:GH$="E":RETURN
2260 REM ***************
2270 REM * GHOST EATEN *
2280 REM ***************
2290 G1=X1(E)*8:G2=Y1(E)*8
2300 PUT(G1,G2)-(G1+7,G2+7),B
2310 PLAY"T255ABCD"
2320 G1=120:X1(E)=15:G2=56:Y1(E)=7
2330 PUT(G1,G2)-(G1+7,G2+7),G
2340 PUT(X*8,Y*8)-((X*8)+7,(Y*8)+7),B"
2350 BN=BN+20:RETURN
2360 REM ***********************
2370 REM * RENEW THE SCREEN *
2380 REM ***********************
2390 FOR Y=0 TO 14
2400 FOR X=0 TO 30
2410 IF P(X,Y)=2 THEN P(X,Y)=0
2420 IF P(X,Y)=6 THEN P(X,Y)=4
2430 NEXT X
2440 NEXT Y
2450 PUT(0,0)-(240,120),SC
2460 RETURN
```



LASER ZONE
MATRIX
HOVER BOVVER
ATTACK of the MUTANT CAMELS
ABDUCTOR
GRIDRUNNER
Llamasoft
AWESOME GAMES SOFTWARE

Go east young man

***David Kally** talks to Raymond Yap of Wongs (UK) about the business of manufacturing computers*

It takes Raymond Yap less than a minute to drive to his office each morning in his red Mercedes.

He has never walked the distance. As he explains with a grin, his one attempt to jog the route had to be aborted half-way. He blames "unhealthy living" for this athletic shortfall.

As managing director of Wongs International (Europe) he looks after the one European outpost of the far east's biggest computer manufacturer. "Wongs is regarded as the leading and largest circuit-board shop in the far east," he says.

Formed 18 years ago, the company began by assembling transistor radios. Now Wongs makes boards for computers and many other types of sophisticated electronic products.

This year it will produce over 30 million circuit boards. As Raymond points out: "That's a lot of products out there with our work in them." To put that figure in some sort of context, Japan will make about 3.4 million video recorders in a year. Commodore, according to Raymond, will make around one million computers this year. "I don't believe their figures of two or three million Vic20s — if that's so, someone must be holding rather a lot in a big warehouse somewhere."

So Wongs is keeping itself busy. The list of manufacturers who use the company reads like a *Who's Who* of computing: IBM, Xerox, Acorn, Atari, Coleco, Apple, Texas Camputers, Torch and Osborne.

The company builds the BBC machine for Acorn — and will soon start production of the Electron. It also manufactures the new 600XL and 800XL machines for Atari, as well as the long-running Atari VCS machine, and makes the keyboards for the Lynx and Torch computers.

"Our speciality is the ability to start up a factory and produce large volume products to schedules," says Raymond. Wongs has factories mainly in Hong Kong and Singapore, but not Taiwan. "Taiwan is a problem — everything you put in there, every machine, gets ripped off."

There is a small plant in the US and the company is looking to add a European factory. "Quite conceivably we will soon put something in the UK — it is an English speaking country with good communications to the other parts of Europe and, most importantly, Britain is my home."

Raymond came to this country when he was 11. Eighteen years later he claims to be "a jack of all trades and master of none". Having sold everything from wellies to double-glazing he has wound-up, after six years with Wongs, in charge of the European operation of a £60m international company.

He is in an almost unique position to stand back and look at what manufacturers are doing. "I have seen many changes in consumer spending.

"The computer industry is just recovering from a big shock. The down-turn in consumer spending during this summer wasn't forecast by companies at all. Texas and Timex got cold feet — they saw sales overall dropping sharply and, at the same time, they appeared to be losing market share. In the US both the TI99/4A and TS1000 (the US ZX81) were regarded as first-generation machines. Because they weren't selling, prices were continually reduced until they were being sold at ridiculous levels.

"Instead, the machines still didn't sell. What now seems to be happening is that a few accepted computers are selling well while the others are doing rather poorly.

"But gradually we are beginning to see the emergence of just a handful of successful computer manufacturers: Commodore, Acorn, Sinclair and IBM.

"At the moment Sinclair and Acorn have got it right — they have become market leaders without having to sacrifice their profit margins in the way Atari has done."

Trying to reduce production costs to regain these lost profit margins is what has led many manufacturers — like Atari — to move their manufacturing to the far east. And to companies like Wongs. Says Raymond: "Overhead costs in the far east can be manipulated more than in other parts of the world — there are no pension schemes, National Insurance payments and other social commitments to be fulfilled."

Wongs undertakes only a support engineering role for its customers. The computer company provides a specification and Wongs buys in the components and builds it.

The company's experience is in component insertion, circuit-boards, power supplies, key switches, plastic housings and metal stamping. "It is fairly simple for us to design and build something like a keyboard but we are not a research and development house.

"We do our own purchasing of components such as the integrated circuits — and our purchasing power is enormous."

Setting up a production line can cost up to £½m and Wongs works with one line per product. "In the far east we have multi-story factories, separating customers floor by floor. Sophisticated test equipment is used to check completed circuit-boards and automatic component insertion equipment helps cut costs."

Commodore is one of the few computer companies for which Wongs does no work. "Commodore is a peculiar animal — it has decided to carry out its own manufacture to its own needs. This puts financial management and planning strains on the company. It is quite an undertaking for them.

"Many of the other companies are getting out of that, just concentrating on the design and marketing of their product.

"It takes an awful lot of money to bring a new computer from the drawing board to the manufacturing stage and it is no longer true to say that there are high sales margins on computers.

"What is worrying is that there are some companies which are taking little or no margins — which is a road to disaster — Texas would be one recent example.

"It is certainly not an orderly market place yet, and it will not be for quite a while. Companies are still entering the market, falling over and failing. Once these disruptive influences have disappeared then co-operation between computer manufacturers may be possible and common operating standards may be adopted. Sinclair, Acorn, Commodore, they are not unrealistic, but unfortunately it is not the right time yet — they are all still jostling for position.

"British designed computers are as good as any other — but the UK has in the past lagged behind in marketing. British manufacturers are still leaders in their technical capabilities and that will continue. People in the US are hoping that the UK companies will go away in time.

"Acorn were lucky. They had a good product and they were lucky to get Auntie's helping hand — but they took advantage of that. The BBC machine we are manufacturing for them for the US is a damn good machine. For $995 you get a BBC B, plus Econet, *View* word processing and an American version of Kenneth Kendall.

"Dragon, Oric and Lynx have all had roughly the same opportunity. There was a time when the Dragon was a much sought after computer. But they had a manufacturing problem and their marketing was weak.

"Sinclair, on the other hand, started off at manufacturing 2,000 Spectrums a month. Now they are up to 60,000.

"We at Wong are a sub-contractor and we have no allegiances. But we have tentacles world-wide and we talk to everyone. It's the same old problem. Taking your opportunities, and following through." ■

Putting the pieces together

***Gary Thorogood** examines a bewitching collection of Vic20 software*

Despite the popularity of the Commodore Vic20 as a home computer I have always felt that the range and quality of the software available has in the past made it rather a poor relation to the Spectrum. This is of course in part due to the system's limited memory. However things seem to be improving, with more and more software houses producing a variety of high-quality programs for the Vic. The following are a small selection of new and not-so-new games currently on the market.

The first of the batch *Jigsaw* by Commodore is for those who enjoy the intellectual challenge of problem solving — mental agility rather than nimble fingers is required. Jigsaw pieces of different colours, shapes and sizes are scattered about the screen and must be reassembled as a perfect rectangle. Movement is restricted, as the pieces cannot cross a set perimeter or overlap one another.

The game has a time limit so the quicker the fit the higher the score. When the puzzle is solved the score is displayed and the next jigsaw appears.

Jigsaw requires a keen mind and can be rewarding when a particular problem is solved. By its very nature, however it lacks the urgency of traditional arcade contests wherein the player takes on dastardly invading aliens or man eating monsters. These are usually set either in a cosmic battlefield or in an obstacle strewn maze and their attraction lies in their addictiveness — the compulsion to surpass one's previous performances. What distinguishes the best of the following games is the programmer's ability in bringing something fresh to the tried and tested formulae.

The most basic of the space games is *Space Travel* by Mikrogen which is based on the familiar idea of destroying ranks of invading aliens whilst avoiding their perpetual onslaught. In this case flocks of space birds are the enemy to be faced. The game is perhaps best suited to the novice rather than the seasoned space cadet.

As an introduction to the genre, *Space Travel* is fine, if rather heavy-handed in design. The characters are too large and the graphics a touch unsubtle. There are two levels of play, so progress can be made and a fair degree of mental and manual dexterity is required. Although fast and exciting in my opinion it lacks the essential element that makes for a really compulsive game.

Ratrace from Commodore (cartridge only) is a much more exciting proposition. In this game the player is a mouse caught in a maze. The objective is to eat all 10 randomly placed cheeses whilst evading the menacing black cats and energetically chasing rats — and doing so in the allotted time (all to the jaunty accompaniment of *Three Blind Mice*).

Unlike most maze games you are presented with only a small section at a time so any movement becomes a journey into the unknown. To help there is a small scale plan on the right-hand side of the screen which not only shows the position of each cheese but also the whereabouts of each rat.

Ratrace is an ingenious game and one that I would recommend wholeheartedly.

Also from Commodore comes *Menagerie* and *Cosmic Cruncher*. Both of these are available in cartridge form only. In the former, a bug has to move through a spider field without being eaten, pause on a garden wall (which is being inexplicably consumed by an unseen mystical energy force) and hitch a ride on the travelling menagerie of animals finally to score at the top of the screen. The game is designed with three initial bugs and more can be added by consecutive scoring. The





various targets are constantly shifting both their locahons and their sconng values There are up to 10 levels of difficulty and obviously a fair degree of skill is needed but I cannot help feeling that I have seen it all before

The same can be said of *Cosmic Cruncher*, which is a more stylised version of *Pacman* The graphics are bright and cheerful, and three hundred colour and maze combinations give you the capability of adding extra invisible (and therefore more dangerous) characters

In this maze-like solar system, the various planets carry different values and the more points tallied the more adept the *Cosmic Cruncher*

These three cartridge games are distinguished by graphics of higher quality than that offered by the majonty of cassettes Less desirable is their cumbersome key control arrangement As always a joystick would provide greater manoeuvrability

Bewitched by Imagine is also based on a *Pacman* grid but has a certain flair which sets it apart from its contemporaries The elaborate and stylish packaging is typical of the Imagine catalogue The proof of the pudding, however is in the program, and here one is not disappointed

The player is plunged into a land overshadowed by death and famine having been transformed by an evil magician into a key and locked within the dungeons beneath his castle Avoiding a plethora of blood hungry ghosts and ghouls, you must escape through the correct doors corresponding to your key colour (there are four colours to choose from) Throughout your journey, you are likely to encounter a number of false trails doors that open on to brick walls and so on — all of which hamper your escape As the game progresses, the screen scrolls up to reveal new sections where the ghouls become even more prodigious and the going gets even tougher

This colourful game has excellant graphics is technically very clever and is fun to play You may choose whether or not to have musical accompaniment — I preferred not to, as the sound of *Greensleeves* ringing out not only seems rather incongruous given the setting but also quite distracting when you are fleeing for your life

One further point is that the key control directions on the insert card are misleading On my keyboard *O* moves the figure upwards, not *P* as stated These however, are minor quibbles All in all, it is a thoroughly absorbing game and one of the best in this selection

Frantic, also by Imagine, is a much harder nut to crack In attempting to bring something new to the world of space travel the game suffers, I think, from being over ambitious As ever, the packaging is examplary and the graphics first class

Your mission is to excavate and mine the many moons of Spectrum (Imagine are very fond of these little puns — remember *Arcadia* where you have to destroy Atarians?) At vanous intervals, you come under the attack of the many alien life forms in and around the planet The screen displays a visor through which you can see yourself plumetting towards the moons and a two-way radar indicating the position of the unseen enemy The game has a time limit, which is linked to a decreasing fuel supply, and points are amassed according to the number and type of alien destroyed

The instructions state that points awarded for destroying the enemy are an unknown factor and that you have to "hope for the best when firing This sums up *Frantic* very well After many attempts I lost patience and began firing blindly hoping that I might eventually score I found *Frantic* bewildering and vague — perhaps someone out there can explain it to me

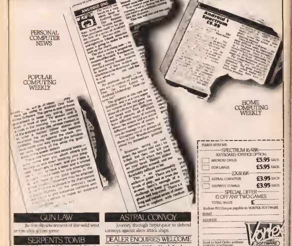
On a more down to earth note, the final game of the batch is *River Rescue* by Thom EMI (cartridge only) As captain of a powerful river boat you have to navigate one of the most hazardous rivers of the world whilst attempting to rescue three intrepid explorers lost in the jungle and take them to the nearby hospital There are all manner of obstacles to be shot down or avoided and the winding banks can become so treacherous that plotting a straight course takes all your reserves of agility and skill There are two levels of difficulty and the game can be played by one or two people Like *Retrace* and *Bewitched* it is a truly addictive game and I'm sure will afford you many hours of amusement

Thees than, are just some examples of the variety of Vic20 game currently on the market Progammers are on the whole becoming more inventive and original graphics more intricate and subfle and games more exciting and compelling The future of Vic20 software looks healthy — let's hope that the trend continues ■

Firm	Program	Cost	Value (1—10)
Commodore Vicsoft 675 Ajax Avenue Slough SL1 4BG	*Menagerie*	£9 99	5
	Rat Race	£9 99	10
	Cosmic Cruncher	£9 99	8½
	Jigsaw	£9 99	7
Imagine Masons Buildings Exchange Street East Liverpool Merseyside	*Frantic*	£5 50	7
	Bewitched	£5 50	10
Mikrogen 1 Devonshire Cottages London Road Bracknell Berkshire RG12 2TQ	*Space Travel*	£5 95	5
Thom EMI Thom EMI House Upper St Martins Lane London WC2H 9ED	*River Rescue*	£19 95	8

"If you buy Android One, you can give up any hope of spending stress-free evenings with your Spectrum..."

HOME COMPUTING WEEKLY



An unwritten rule

***Andy Wilson** introduces structured programming on the ZX81 in the first of a three-part series*

The English language contains many words which if they were to appear upon the pages of this publication, would send many a reader into spasms of angry letter writing English of course is not unique in this respect French, German, Chinese and Serbo-Croatian they all have their taboo words and phrases

Most programming languages, however, appear to ignore this unwritten rule If a word is there, it is there to be used

Algol 60 (the original version of the language) is one exception Although the *Goto* statement is supported, its use is frowned upon by most programmers It goes against all the principles of that great cult, Structured Programming

The home computing press is very fond of the phrase but hardly ever bothers to explain exactly what is Structured Programming I aim to give the reader a rough idea of the underlying concepts and, by introducing a few new Basic commands, show how ZX81 programs can be made much more readable Although the programs and machine code routines will be specific to the humble Sinclair machine, many of the ideas will be useful to owners of other computers

As you probably realise, readability is the most important idea behind Structured Programming One of the biggest problems facing commercial programmers is deciphering other people's programs In the commercial world more time is spent amending and debugging old programs than writing new ones so readability is very important

A well structured program should reflect the thinking behind it It should where possible, be divided into natural 'blocks' where each block contains the code for one process

The problem with the *Goto* is that when we make a decision in the real world we usually decide on a complete course of action For example suppose you are sitting in your favourite armchair reading the latest *PCW* when you hear a bell There are two possibilities it could be the doorbell or the telephone What should you do?

In Basic the problem could be written as follows

```
10  IF DOORBELL THEN GOTO 100
20  Code for answering phone

90  GOTO 200
100 Code for answering door

200 Rest of program
```

A slight improvement would be to use *Gosubs* This is like having a notebook containing instructions on how to answer the door or telephone and when you have decided which bell is ringing choosing the appropriate page number to find out what to do next Surely it would be better if we could write

```
10 IF DOORBELL THEN ANSWERDOOR
20 IF PHONEBELL THEN ANSWERPHONE
```

```
-LOADER
---------

10 LET L=16[illegible]
20 INPUT U$
30 IF U$="S" THEN STOP
40 SCROLL
50 PRINT L,TAB 7,
60 PRINT U$(1 TO 2);
70 POKE L,16*CODE U$+CODE U$(2)
-476
80 LET U$=U$(3 TO )
90 LET L=L+1
100 IF U$<>"" THEN GOTO 60
110 GOTO 20

ISTING 2

-DUMP

[illegible]

ENTER S TO STOP LOADER
```

Continued on page 21

PROGRAMMING

or even better

```
10 IF DOORBELL THEN ANSWERDOOR ELSE
   ANSWERPHONE
```

This can be done in many languages, including Algol, Pascal and BBC Basic. It is done using a structure called the *Procedure*.

A *Procedure* is a bit like a *Gosub* routine, but is called by a name rather than a line number. In Algol the procedure for answering the phone would be defined as follows:

```
PROCEDURE ANSWERPHONE,
BEGIN
Code for answering phone

END
```

and thereafter any reference to *Answerphone* would execute the procedure. Similarly, in BBC Basic we could write

```
10 DEFPROC ANSWERPHONE

   Code for answering phone

200 ENDPROC
```

and the procedure would be called by the statement *Proc Answerphone*.

To see the effect this has on readability, find a listing of a program written for the BBC which avoids the use of *Gotos* and *Gosubs* and compare it with a program written for another, unfamiliar micro.

There is another occasion on which the *Goto* is often used. Suppose you are still sitting in your chair reading *PCW*, but this time you are expecting a telephone call. You want to carry on reading until the telephone rings. How could this be modelled in Basic? The usual way would be to write

```
10 Code for reading PCW

50 IF NOT PHONE THEN GOTO 10
```

This is like saying, "I will carry on reading but now and then I will check to see if the telephone is ringing. If it isn't, I will go back to my reading."

A better model could be written using a structure found in many Basics, including of course that on the BBC. This is the *Repeat-Until* loop. It is usually used as follows

```
10 REPEAT
20 Code for reading PCW
50 UNTIL PHONE
```

It should be immediately obvious how this is a much more accurate model of the original problem.

Now to get more machine specific. The accompanying machine code routines allow *Procedures* and *Repeat-Until* loops to be used on the 16K ZX81.

The code is in a Rem line, so the first thing to do is to create a line, *1 Rem* containing 465 characters. The most straightforward way to do this is to simply type it in directly (in *Fast* mode). Each line has 32 characters, so you need 14 lines, including the first one, with a 15th line of 23 characters only. If you have got it right, *Peek 16511* will be *211*.

Other people have their own favourite methods but I tend to rely on the old-fashioned way, or I use an assembler which does it for you anyway.

When you have a perfect Rem line, enter the hex loader in listing 1. Next comes the boring bit: listing 2 is a hex-dump which all needs to be *Poked* into the Rem line using the aforementioned loader.

Check the numbers carefully against the listing as you enter them — it is best to enter a whole line, five bytes at a time. If you notice a mistake after pressing *Newline*, note the address and *Poke* the correct number in when you have finished (if you are not sure how to convert from hex to decimal, look at line 70).

When you are satisfied you have entered the machine code correctly, delete the loader program line by line. Now enter the Basic program in listing 3. This effectively defines the words to be used as new Basic commands. After entering the first line (line 10), type as direct commands, *List 10*, followed by *Poke 16419 10*. If you fail to do this, whatever you type in, only line 1 will appear on screen.

The program is now more or less ready to use. It would be nice, though, if we could make it all "invisible" and undeletable. Surprise, surprise, we can!

All we have to do is change all of the line numbers to 0. Presuming your Rem line is the right length, the addresses to be *Poked* are as follows: *16510, 16981, 17005, 17028, 17051, 17076, 17101, 17127* and *17154*.

When you have *Poked* all of these with *0* enter *10 Rem Structured Programming*, followed by, once again, *List 10*, *Poke 16419 10*. Now *Save* the program on tape.

The new commands are listed in listing 4. Note that commands (ii) and (iii) are always used together. Procedure names should be as self-explanatory as possible and should be reserved for this purpose only.

The error messages are more or less self-explanatory, but it should be noted that the line numbers often refer to the line that 'finds' the error, rather than the actual error.

Limitations to use

As mentioned previously, variables used as procedure names should not be used for any other purpose within the program. If other machine code routines are used and given 'names', these 'names' should not begin with *E* or *D*.

Unfortunately, procedures cannot be nested, ie, one procedure cannot be defined within another. This is because the nested procedure would remain undefined until the outer procedure was called.

The condition after *Until* should be Boolean, ie, it should result in an answer of *1* or *0*.

Both *Repeat-Until* loops and procedure calls can only be nested up to five deep, as they rely on special stacks of fixed size. *Scroll* should be used with care. If the display file is upset, the error message routine may cause a system crash. It is best to follow *Scroll* with

```
PRINT TAB 21, "space"
```

An example of how to use the procedure routines is given in listing 5. This is the program used to produce the hex-dump in listing 2.

Remember, the whole idea is to make the program as readable as possible, so use meaningful names and try to separate blocks of program using empty Rem statements. Make liberal use of proper Rems as headings to explain the program, and try not to worry too much about memory — if you've got it, use it! ■

```
[illegible]

10 LET [illegible]
20 LET [illegible]
30 LET [illegible]
40 LET [illegible]
50 LET ENDP[illegible]
60 LET CR[illegible]
70 POKE [illegible]
80 POKE 16417 [illegible]

LISTING 4

[illegible]ANDS USED

[illegible] RAND USR REPEAT

[illegible] POKE UNTIL,(CONDITION
RAND USR CHECK
```

```
[illegible]
40 LET A=A-16[illegible]
50 PRINT CHR$ [illegible]
60 RAND USR ENDPROC
70 REM
100 FOR [illegible]
110 PRINT I TAB 7
120 FOR [illegible] TO 4
130 LET [illegible]
140 IF [illegible] THEN STOP
[illegible]
```

Welcome to the machine

In response to popular demand, at long last the machine code series you have been waiting for. Part one of six

This series is aimed at the Spectrum owner who wants to progress his or her machine code beyond the level of beginner's books. It will not teach you how to use the various codes — I assume that you have already reached this stage — but it will show you how you can include them in routines of your own by giving many working examples.

Of the many requests that are made of me (most of which are physically impossible!) one of the most common is to give details of Spectrum Rom entry points, so that machine code programs can be kept as small as possible and also ensure that they work quickly. This series will hopefully give you some working tools to include in your programs — some using the Rom, and some not.

All the way through the series, I assume the use of an assembler, such as that published in the *Spectrum Pocket Book*, although most assemblers that handle symbols will suffice. There are very good reasons for this. First of all, from my own point of view, I resent converting mnemonics into hex (or even worse, decimal!) when the Spectrum is perfectly capable of doing the job for me.

Secondly, any serious programmer will want to be able to alter any routine quickly and easily. If you have entered a routine in hex, you must either leave "gaps" in the program to allow for corrections, or recalculate your "jump" addresses when you want to add in a new instruction. An assembler does away with all this.

Throughout the series we'll be looking at topics ranging from "transferring from Basic" where you can see how some of the familiar Basic functions can be undertaken in machine code, to making use of the Spectrum facilities (display, colour, sound, graphics, keyboard, etc). Later on, you'll see how you can use interrupts to allow continuous sound and action.

This week's lesson is something rather basic (sorry) but nevertheless, very important to beginners — the use of arithmetic within machine code. Addition and subtraction are no real problem, since the Z80 includes instructions to handle these directly, whether in 8 or 16-bit form.

ADD HL,DE adds the 16-bit value in DE to HL.
SBC HL,DE subtracts the 16-bit value in DE from HL (including carry if set)

However, multiplication and division represent a real challenge. The two routines listed will do this for you — 16-bit multiplication and division. Both routines are relocateable (for those non-Assembler users) and re-entrant (for those "interrupt mode 2" fanatics) and in both cases the values in DE and HL are used leaving the result in registers HL. As a real bonus, the division routine leaves the remainder in registers DE. This makes it simple to simulate the "mod" function found in Microsoft Basic, or to write the equivalent of

IF x<>y*INT (x/y)

... in machine code. It does make the routine slightly longer than a normal division subroutine, but it's well worth the extra power that it gives you.

As an example, the following few lines show you how to use these routines in your own programs.

```
LD HL,6
LD DE,27
CALL MUL16 gives 6 * 27 = 162 in HL
LD DE,4
CALL DIV16 gives 162/4 = 40 in HL and remainder 2
in DE
```

They are also useful for calculating screen row/column addresses. If you have a data area (here referred to as SPOS) which holds the offset from the top left-hand corner of the screen of the next place to print a character, you can then set the co-ordinates in the following fashion.

```
LD HL,(SPOS) obtain screen offset
LD DE,32 number of characters per row
CALL DIV16 determine row & column
LD A,22
RST 10H print "AT" character
LD A,L row number (quotient)
RST 10H
LD A,E column number (remainder)
RST 10H
```

Next week we'll take a look at ways in which a Basic programmer can transfer into machine code concepts by considering the equivalent of "variables and arrays". ■

By Trevor Toms, author of The Spectrum Pocket Book, published by Phipps Associates

```
16-bit Multiplication

Multiplies the 16 bit unsigned value in HL [illegible] the
16 bit unsigned value in DE, leaving the
result in HL.

Addr He        Op    Operands

FF58           MUL16:
FF58 44         LD    B,H
FF59 4D         LD    C,L
FF5A 3E 10      LD    A,16
FF5C 21 0000    LD    HL,0
FF5F A7         AND   A
FF6D           MUL16A
FF60 CB 18      SRL   B
FF62 CB 19      RR    C
FF64 30 00      JR    NC,MUL16D
FF66 19         ADD   HL,DE

FF67           MUL16D:
FF67 CB 13      RL    E
FF69 CB 12      RL    D
FF6B 3D         DEC   A
FF6C 20 F2      JR    NZ,MUL16A
FF6E C9         RET

Symbols:
MUL16  FF58     MUL16A FF6D
MUL16D FF67
```

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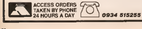
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16-bit Division

Divides the 16-bit unsigned value in HL by the unsigned 16 bit value in DE. The result is left in HL with remainder in DE.

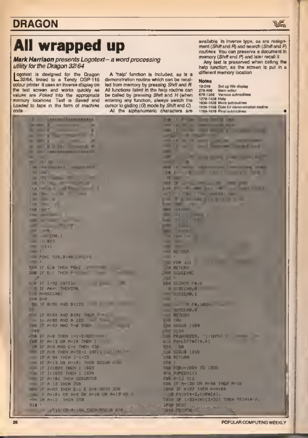
```
Addr Hex      Op   Operands

FF58          DIV16:
FF58 7A        LD   A,D
FF59 2F        CPL
FF5A 57        LD   D,A
FF5B 7B        LD   A,E
FF5C 2F        CPL
FF5D 5F        LD   E,A
FF5E 13        INC  DE
FF5F E5        PUSH HL
FF60 AF        XOR  A
FF61 67        LD   H,A
FF62 6F        LD   L,A
FF63 E3        EX   (SP),HL
FF64 7A        LD   A,D
FF65 B3        OR   E
FF66 2000      JR   NZ,DIV16A
FF68 E1        POP  HL
FF69 C9        RET

FF6A          DIV16A:
FF6A 0611      LD   B,17
FF6C          DIV16B:
FF6C CB15      RL   L
FF6E CB14      RL   H
FF70 3000      JR   C,DIV16E
FF72 10F8      DJNZ DIV16B
FF74 1800      JR   DIV16X
FF76          DIV16C:
FF76 E3        EX   (SP),HL
FF77 E5        PUSH HL
FF78 19        ADD  HL,DE
FF79 3000      JR   NC,DIV16D
FF7B E3        EX   (SP),HL
FF7C          DIV16D:
FF7C E1        POP  HL
FF7D E3        EX   (SP),HL
FF7E CB15      RL   L

FF80 CB14      RL   H
FF82          DIV16E:
FF82 E3        EX   (SP),HL
FF83 CB15      RL   L
FF85 CB14      RL   H
FF87 E3        EX   (SP),HL
FF88 10EC      DJNZ DIV16C
FF8A          DIV16X:
FF8A D1        POP  DE
FF8B CB2A      SRA  D
FF8D CB1B      RR   E
FF8F C9        RET

Symbols:
DIV16  FF58     DIV16A FF6A
DIV16B FF6C     DIV16C FF76
DIV16D FF7C     DIV16E FF82
DIV16X FF8A
```



All wrapped up

***Mark Harrison** presents Logotext – a word processing utility for the Dragon 32/64*

Logotext is designed for the Dragon 32/64, linked to a Tandy CGP 115 colour printer. It uses an inverse display on the text screen and works quickly as values are *Poked* into the appropriate memory locations. Text is *Saved* and *Loaded* to tape in the form of machine code.

A 'help' function is included, as is a demonstration routine which can be recalled from memory by pressing *Shift* and *R*. All functions listed in the help routine can be called by pressing *Shift* and *H* (when entering any function, always switch the cursor to gliding (*G*) mode by *Shift* and *C*).

All the alphanumeric characters are available in inverse type, as are realignment (*Shift* and *R*) and search (*Shift* and *F*) routines. You can preserve a document in memory (*Shift* and *P*) and later recall it.

Any text is preserved when calling the help function, as the screen is put in a different memory location.

Notes

10-260	Set up title display
270-660	Main editor
670-1260	Various subroutines
1270-1420	Help
1430-1620	More subroutines
1630-1690	Data for demonstration routine
1700-1870	Final subroutines

```
[illegible]
     FOR I=1 [illegible]
1070 P=PEEK(I)
1080 POKE I-514,P
1090 NEXT
1100 RETURN
1110 FOR I=1024 TO 15[illegible]
1120 P=PEEK(I)
1130 POKE I+514,P
1140 NEXT
1150 RETURN
1160 SCREEN0,1 FOR I=2100 TO 2047
     P=PEEK(I-1112)
     POKE I,P
1190 NEXT
1200 RETURN
1210 SCREEN0,1:FOR I=2130 TO 2047
1220 P=PEEK(I)
1230 POKE I-1112,P
1240 NEXT
1250 SCREEN0,0
1260 RETURN
1270 CLS
1280 PRINT         HELP COMMAND        1/2

1290 PRINT EDITOR
1300 PRINT LEFT  ARROW            BACKSPAC
E  RIGHT ARROW         ..SPACE 1/10 SPACE
BAR            SPACE       ENTER.
       NEWLINE    UP   ARROW.......
MOVE UP    DOWN  ARROW            MOVE DOW
N  CLEAR.                SCREENCLEAR';
1310 PRINT SHIFT & E              ERASE LI
NE SHIFT & C          CURSOR SWAPSHIFT
  .             FIND LETTER'
     PRINT@480 "PRESS C TO CONTINUE,R TO
RETURN',
     A$=INKEY$ IF A$=   THEN 1330
     IF A$= R  THEN RETURN
     CLS
1360 PRINT         HELP COMMAND        2/2

1370 PRINT FUNCTIONS
1380 PRINT SHIFT & A               RE-ALIGN
  SHIFT & O .          DOCU PRINT SHIFT
  [illegible]         CALL HE[illegible] & L
  .    LOAD TAPE  SHIFT & [illegible]
SAVE TAPE  SHIFT & P               RECALL
MEMSHIFT & P            PRESERVE MEM
1390 PRINT@480, PRESS R OR C TO RETURN .
1400 A$=INKEY$
1410 IF A$<> R  AND A$<> C  THEN 1400
1420 RETURN
1430 CLS4
1440 PRINT@224,     INPUT COLOUR (0-3)? ;
C
1450 PRINT#-2,CHR$(18) PRINT# [illegible]  PR
INT# 2,CHR$(12). RETURN
1460 CLS4
1470 PRINT@0, INPUT SEARCH LETTER? ; INP
UT A$ A=ASC(A$) A=A 64 PRINT@64  [ENTER]
 TO START OR CONTINUE     [SPACE] TO STOP
  OR RETURN
1480 W=0
1490 INPUT Q$ GOSUB 1210
1500 FOR I 1024 TO 1535
1510 R=PEEK(I I)
1520 P=PEEK( )
1530 IF P=A THEN GOSUB 1570
1540 IF W=1 THEN 1560
   0 NEXT
     RETURN
     Q$=INKEY$
     POKE I,255[illegible]
     IF Q$<> [illegible]
[illegible]
     IF Q$= [illegible]
1610 W=0'RETURN
1620 W=1 I=I-1 A[illegible]
1630 DATA 20,8,5,19 3[illegible]
13,15,14,15,20,18,1,20[illegible]
32,32,32,32,32,32,9,20[illegible]
1,5,4,32,5,14,20,15,32,[illegible]
32,32,32,32,32,32,32,32[illegible]
,9,13,5,32,20,8,5,19,33,18,[illegible]
1640 DATA 1,13,32,5,19,32,[illegible]
32,5,24,9,3,21,20,5,4,48,32,[illegible]
9,32,5,18,1,19,5,4,32,23,8,5[illegible]
,32,32,25,15,21,32,19,1,22,[illegible]
,5,20,8,9,14,7,32,8,14,32,20,[illegible]
2,32,32,32,32,13,5,13,15,18,25,[illegible]
1650 DATA 2,21,20,32,9,6,32,25,[illegible]
23,1,14,20,32,32,32,32,32,32,[illegible]
,15,32,20,18,25,32,19,14,5,32,[illegible]
,8,5,32,6,21,14,3,20,9,15,14,15,[illegible]
,32,32,15,21,3,8,32,1,19,32,19,5,1,18,3,
8,32,9,20,32,19,1,22
1660 DATA 5,19,32,32,32,32,32,32,32,32,3
2,25,15,21,32,8 18,15,13,32,23,18,3,20,9
,14,7,32,5,14,32,1,32,2,21,12,11,32,32,3
2,32,32,32,15,6,32,20,5,24,20,32,19,15,3
2,20,8,1,20,32,25,15,21
1670 DATA 32,8,1 22,5,32,32,32,32,32,32,
32,32,19,15,13,5,20,8,5,14,7 32,20,15,32
,19,5,1,18,3,8,32,20,8,18,15,21 7,8,46,3
2,32,32,32,21,14,20,9,12,32,25,15,21
1680 DATA 32,7,5,20,32,20,8,5,32,8 1,14,
7,32,15,6,32,32,32,32,32,32 32,20,8,9,14
,7,19,32 9,32,18,5,3,15 13,13,5,14,4,32,
25,15,21 32,20,15,32,32,32,32,32,32,32,1
8,5,1,4 3, 20,8,18,15 21,7,8 32 8,5,12,1
6,32,3,1 18,5 6,21,12,12 25,46,32,32,32,
32
1690 DATA 32,3[illegible] 32,32 32,32,32,32,32,34,
2,15,15,4,32 1[illegible] 21,3,11 33,33,34,32 32,3
2,32,32,[illegible],32 32,32 32 32,32,32,32 32,32
,32,32,32 [illegible] 2 25,32,[illegible],15,8,20,23,1
,18,5,46,32 32,32,32,32,32 32 32
1700 IF E=1 THEN 1730 ELSE FOR J I=1 TO
I+31
1710 POKE J,32
1720 NEXT
1730 RETURN
1740 D=0
1750 FOR I=1024 TO 1504 STEP 32
1760 D=0
1770 FOR J=0 TO 31
1780 P=PEEK(I+J  IF P<>32 AND [illegible] THE
N D=D+1
1790 NEXT
1800 M=INT 16 (D/2))
1810 FOR J=31-M TO 0 STEP -1
1820 P=PEEK(I+J)
1830 POKE J+I+M,P
1840 NEXT
1850 FOR J=0 TO M 1
1860 POKE J+I,32
1870 NEXT NEXT RETURN
```

[illegible] EXT (Dra on 32/64)

Microdrive revisited

***Andy Pennell** assesses the ZX Microdrive three months after its launch*

It's now just over three months since the launch of the long-awaited Sinclair ZX Microdrives for the Spectrum Thanks to *PCW* I was one of the few who got one on the day after their launch although I couldn't keep it for very long

Luckily I was one of the very first Spectrum customers (number 177 to be exact) and I received a priority order form on the day after the launch, which I immediately sent off with a cheque Like all customers I was limited to a maximum of two Microdrives, so I ordered my full quota I received them in a Sinclair personal best of 21 days, and they both worked

The first 400 customers, including myself, got a Helpline telephone number to contact one of the engineers at Cambridge A friend also received a Microdrive at the same time, and he had to use the Helpline immediately This was because his Spectrum crashed with the Interface connected, but it worked perfectly on mine After telephoning, he was told that the Interface 1 was incompatible with certain Spectrums He was sent replacement units that he tested before returning the faulty ones

The original interface, like mine, was an Issue 3, which had an Eprom and a few modifications on it, but the replacement was an Issue 4, and was completely different inside This is the current version, and seems to work with all types of Spectrum

Shortly after this we both began to experience an alarming rate of cartridge failure The cartridges are tiny black boxes which contain the tape loop and were the source of most of our hardware problems There were two types of failure — the first was a total seizure that prevented the tape from turning the second was the tape leaving the cartridge, catching on the tiny pinchwheel in the Microdrive, and wrapping around itself, jamming the drive and making the cartridge useless

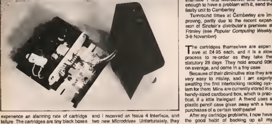
According to a Sinclair spokesperson these problems were caused by a design fault in the cartridges which has now been corrected This would seem to be so, as neither of us has had any problems with cartridges recently

During the spate of total failures I sent my whole system back for replacement, and I received an Issue 4 Interface, and two new Microdrives Unfortunately, they ran at different speeds so that cartridges created on one would not load on the other In addition to this all of my existing software created on my previous drives would not load on either so I again used the 'hotline'

I was told that this was a known problem, with no easy solution After expressing disbelief at this response, I was told to return both drives and they would try and supply two that ran at the same speed! In the end I returned one drive, and the replacement thankfully runs at what appears to be the correct speed Since then, Nigel Searle of Sinclair has denied any such problem, though only time will tell if there is or not

If you are one of the lucky ones with an Interface 1 and Microdrive, and unlucky enough to have a problem with it, send the faulty unit to Camberley





Turnround times at Camberley are improving, partly due to the recent expansion of Sinclair's distributor's premises at Frimley (see *Popular Computing Weekly*, 3-9 November)

The cartridges themselves are expensive at £4 95 each, and it is a slow process to re-order as they take the statutory 28 days They hold around 90K on average, and come in a tiny case

Because of their diminutive size they are very easy to mislay, and I am eagerly awaiting the first interlocking racking system for them Mine are currently stored in a handy-sized cardboard box, which is practical, if a little inelegant A friend uses a plastic pencil case given away with a few purchases of a certain toothpaste!

After my cartridge problems, I now have the good habit of backing up all my software on cartridge to cassette, in case of failure I am just completing a machine-code program that transfers the contents of a whole cartridge onto a C60 cassette, and can then transfer it back if the cartridge fails (or gets lost)

I have to admit that the main contents of my cartridges are games, so that my favourites load quickly. For example *The Hobbit* and *Valhalla* can each load in under 10 seconds, and *Jetpac* in around six. It is regrettably rather difficult to convert commercial cassette programs on to Microdrive for a couple of reasons. The first is getting around the protection methods used for which I will give no clues, and the second is simply lack of memory.

Most 16K games use *Clear* to move Ramtop down as low as possible. The problem occurs because there is normally insufficient spare memory to use the Microdrive, as a *Save* takes about 600 bytes, so machine-code has to be used to shift the code about.

Another problem is that due to a serious bug in the Interface Rom if Ramtop is too low, or a Basic program too big, the machine will sometimes crash if you try a *Save* or *Load*. It crashes while leaving the Microdrive motor on, forcing you to pull the plug out while it goes round, often damaging the tape and losing programs. Sinclair say that they are working on the bug.

As well as the extra Microdrive commands, there are two new commands not mentioned in the Interface manual, namely *Cls #* and *Clear #*. The first clears the screen back to the switch-on colours, and is very useful at times, while the second is used to tidy up the streams area, and is also useful, though it can be a bit dangerous. I discovered their explanations in the database program supplied on the demo cartridges with each Microdrive, as they are absent from the current manual.

An important feature of the Interface 1 is that it allows you to add your own commands to the Basic, if you know how to program in machine-code. The Sinclair manual makes no mention of it, though modesty prevents me from mentioning which new Sunshine book explains the procedure.

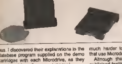
Machine-code programmers can also use the Microdrives using hook codes, which are 23 functions. Sinclair appear to be paranoid about software piracy, so all but one of the Microdrive hook codes have been designed to prevent program files being read, which means that routines to do this have to be called directly in the Interface.

This would be fine if it were not for the fact that Sinclair say they are going to change the ROM routine locations which will make any machine-code programs that uses them invalid. Hopefully Sinclair will correct the bugs by patches, so that all the routines stay in the same place.

Already the first Microdrive-compatible software has appeared from Richard Shepherd, but it is supplied on cassette. Not much commercial software is expected to appear on cartridge for a while, for two reasons: the first is the cartridges themselves, their cost, availability and reliability.

The second is the problems of mass-duplication. Cartridges have no official guarantee period and are only available at a discount for orders of over 500, which is currently over a tenth of the total number of Microdrive users in existence. It is also much harder to protect Basic programs that use Microdrive commands.





The inner workings of a Sinclair ZX Microdrive (top) and two of the mini cartridges (left) which caused early problems through jamming

Although the Microdrive is the most publicised facility of the Interface 1 it also has networking and RS232 facilities. I have tried the networking with two friends with Interfaces and it works very well. One company has just released a game that uses the network for two players, and I am dying to get hold of it.

The RS232 facility also works, and I have successfully connected my Spectrum to an Apple with it. For communication to other machines it is great but it is not so good for driving printers. Assuming you have an RS232 printer, which can involve the purchase of a £60 adaptor card in the case of Epsons and others, you can send text, listings and, if you write the necessary software, screen copies. But it is not possible to use Tedi to produce neat output, like I am used to with my Centronics printer interface.

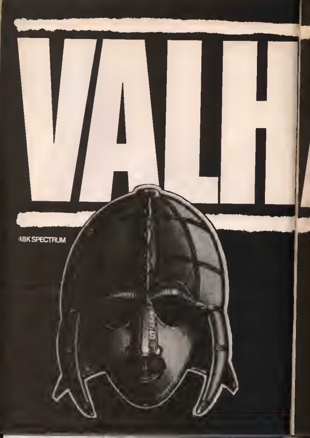
Having a real keyboard and case by Dean Electronics, I was initially worried whether I could plug my Interface 1 into it, but I could — just. I don't know if this is possible with any other keyboards though. I also have a Hilderbay printer interface and Kempston joystick interface, both work with the Microdrives, although you could have problems with your joystick plug on the Kempston interface, as there may not be sufficient clearance.

As some details have been known about the Interface 1 I/O ports for over a year, most hardware should work with it, but two items that don't are the *LPrint* interface by Euro Electronics and the programmable joystick interface from Cambridge Computing. There also seem to be problems with the Micronet 800 adaptor.

What of availability? Although no one at Sinclair is allowed to say exactly how many Microdrives there are, it is believed to be about 4000. At that rate it will be over 25 years before all the Spectrum customers get Microdrives! Order forms have a high rarity value, and avid *PCW* readers will already have seen the first Wanted ad offering to pay for one.

Delivery times of Microdrives and cartridges are under 28 days, but I wish cartridges at least were available in shops, like blank cassettes.

The Microdrives are not expected to be available in the shops until well into the New Year, so around 600 000 Spectrum owners are going to have to be patient for a while longer. ■



VALH
48K SPECTRUM

Think of a number

John Scriven and Patrick Hall present a simple number game in the first of a two-part series

Although it has been pointed out that exciting displays do not turn a mediocre program into a good one, there is no doubt that some programs benefit from interesting graphics In many computers it is necessary to resort to machine code routines to speed up the display The hardware and the operating system of the BBC combine to produce one of the fastest copies of Basic in any home computer

Firstly though an indication of simple ways in which the computer can do tasks faster and more efficiently than humans

There is a game that you can play using the blackboard a piece of paper, or just your memory It is the familiar one of 'I am thinking of a number — ask me any question about it you like but I can only reply using yes or no Faced with this problem for the first time, the child may be inclined to guess If he or she realises that the number can be anything under (say) 1000, it is not long before it is appreciated that the task is difficult, and that some sort of logical strategy must be employed

In a classroom the class usually divides up into guessers, hypothesisers and pseudo-hypothesisers Guessers do just that hypothesisers try to reduce the number of possible choices by asking such questions as 'is it an even number? or 'is it less than 500? Pseudo-hypothesisers are more subtle than the guessers If the response 'no is received to the question 'is the number less than 500?, then the sort of question they will ask is 'is it more than 500? It sometimes seems a big hurdle to jump before they realise that a no response to a question provides as much information as a 'yes

This sort of game is a useful activity as it can improve mental skills including memory and visualisation of a sort of internal number line It also helps develop logical questioning and inquiry strategies You can probably see that the most logical strategy to follow is to approximately divide the answer by two

A typical series of questions may go as follows

Number is 242
Is it larger than 500? No
Is it larger than 250? No
Is it larger than 125? Yes
Is it larger than 190? Yes
Is it larger than 230? Yes
Is it larger than 240? Yes
Is it larger than 245? No
Is it larger than 243? No
Is it larger than 241? Yes
Is it 242? Yes

Using this binary chopping method, it is always possible to reach the number without guessing in less than 10 attempts — 2 raised to the power of 10 is of course 1024 Most older children will adopt this method or one similar until they get fairly close and then guess It is not envisaged that they will actually be calculating the odds on a correct guess, although at this level, it does resemble gambling!

A computer can choose the number, select correct responses and give the total number of attempts at the end In this way, a teacher or parent can be relieved of the task of administering this game to children and the program allows an individual or group approach For the child who finds it difficult to acquire a good strategy, it can provide as much practice as is necessary

The program has been made as simple as possible to show how even short programs can have their point

Commentary
Lines 50 230 contain the *Repeat-Until* loop This will repeat the program until the *Escape* key is pressed Variable 'score contains the number of guesses so far Variable 'top is the upper limit for the number, and 'bottom, the lower limit

Lines 120-2 contain the input *Repeat* loop This is only terminated when guess = number If guess = number, then line 170 sends control to *Procright* at line 260, which simply prints out the number of attempts ■

This is an extract from *Programming for Education on the BBC computer* by John Scriven and Patrick Hall and published by Sunshine Books

Number

```
 10 REM ** Number Guesser **
 20 REM ** A.J.S. 1/4/83  **
 30 REM
 40 MODE1
 50 REPEAT
 60   CLS
 70   score = 0
 80   bottom = 0
 90   PRINT"I will think of a number. You
must try"
 95   PRINT"to guess it in as few goes as
you can."
100   INPUT "Choose a top limit for your
number "top
110   number = RND(top)
120   REPEAT
130     PRINT"The number lies between ";
135     PRINTbottom;" and ";top
140     score = score + 1
150     PRINT "Enter guess no.";score;" ";
160     INPUT guess
170     IF guess = number THEN PROCright
180     IF guess   number THEN top = guess
190     IF guess < number THEN bottom = guess
200     UNTIL guess = number
210   PRINT"Press space bar to go again"
220   A$ = GET$
230   UNTIL FALSE
240 END
250
260 DEF PROCright
270 PRINT"You got it in ";score;" goes"
280 ENDPROC
```

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SOFTWARE

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CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums. e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit. Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi Technology world and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35 000, then the graphics can hardly be considered high resolution. Without high resolution graphics displays such as those used in games tend to be 'Chunky' in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects, very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications, very important if the purpose of purchasing a computer is' educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU. If it is less than 32K think again, is it enough?

● Computer Language

It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However there are a number of BASICs, some being very different from the rest. A de facto standard in the computer industry is Microsoft BASIC. Learn this one and you will be able to program in the majority of computer BASICs, such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you, able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor as well as produce HI FI sound effects.

● Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

Choosing the right system could save you from [illegible] money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

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A spanner in the works

***Boris Allan** reveals some hitherto undisclosed bugs in Commodore 64 Basic*

Integer values are whole numbers with no fractional part. Integers are stored as whole numbers in two bytes (ie, 16 bits), and integer constants might be *3* or *−4567E3*, where each is stored exactly, with no approximation. Integer variables are shown with a % suffix eg, *X%* or *TJ%*. Integers take exact (ie non-fractional) values from *−32768* to *32767*.

Real values are numbers with fractional parts so note that *3.0* is real number, whereas *3* is an integer. *1.23456* and *1234.56* are both real numbers and can be written as *1.23456E0* and *1.23456E3* respectively. The portion before the *E* is sometimes called the "mantissa" and the portion after the *E* is called the "exponent".

Real values are stored in the 64 in a similar manner. The number is stored as a mantissa of four bytes (32 bits ie an accuracy of about 9 digits) and an exponent of one byte (8 bits ie about *E−39* to *E+38*). One bit of the 32 mantissa bits is devoted to holding the sign of the number (*1* for negative and *0* for positive numbers).

Real numbers take positive values ranging from *2.93873588E−39* to *1.70141183E+38*. Negative values are rather stranger. Try the short program

```
10 T=1
20 T=T/2 : PRINT T : GOTO 20
```

and watch the succession of values as *T* becomes steadily smaller. Eventually we reach

```
5.87747176E-39
2.93873588E-39
0
```

and all is fine. Trying

```
10 T=-1
20 T=T/2 : PRINT T : GOTO 20
```

reaches

```
-1.17549435E-38
-5.87747176E-39
2.93873588E-39
0
```

and we have discovered a bug in the 64 Basic system. Half of *−5.87747176E−39* is not *2.93873588E−39*.

We can produce some further errors

```
T=4.25352958E+37
PRINT T*2
```

produces an *?overflow error*, whereas

```
PRINT T+T
```

gives the result *8.50705917E+37* not an error. *T*2* is exactly the same as *T+T*. Thus, we have discovered another bug in 64 Basic. Continuing with

```
T=T+T : PRINT T : PRINT T+T
```

produces the value *8.50705917E+37* for the first *Print* and an *?overflow error* for the second *Print*

```
PRINT 8.50705917E+37 + 8.50705917E+37
```

gives an answer *1.70141183E+38*. To multiply by 2 (and not to add) gives an *?overflow error* again.

Some of the 64 Basic routines for real arithmetic are incorrect at the extremes and may possibly be so for less extreme examples.

Logical values are *−1* (for "true") and *0* (for "false"). When a logical comparison is made both sides of the comparison are effectively turned into 16 bit integers. If we try

```
PRINT T=T
```

(where *T* is the large number above) the result is *−1* (ie, it is true that *T* equals *T*). If we then try

```
PRINT T AND T
```

there is an *?illegal quantity error* because the number *T* is out of bounds for the operation of and. To use

```
P=1 : PRINT P AND P
```

gives the answer *1*.

T is too large a number to be converted into a 16 bit integer, whereas *P* easily fits. If every bit of a 16 bit number is "true", ie, every bit is set to *1*, then the number is *1111111111111111* and that as a two's complement number, is *−1*. Logical values can result from logical comparisons or operations, but — as they also have numerical values — logical values can be treated as integer or real values, depending on the context.

String values are ordered collections of characters where normally characters are distinguished from variables or constants by being enclosed in quotes. *"X"* is a character but *X* is a variable, *"X/2"* is a string whereas *X/2* is an arithmetical operation and *"222222"* is a string but *222222* is a constant.

Each character (eg *"X"* or "/" or "2") has two codes associated with it. The first code, the ASCII code, relates to how each character is stored in one byte of memory (most computers use ASCII codes). The second code, the screen display code, relates to how each character is presented on the display screen (these code values are specific to the 64).

String variables are distinguished by a *$* suffix eg *A$* or *THIS$* (the latter is equivalent to *TH$*).

Computing values

Unless otherwise constrained the 64 always behaves as if the numbers with which it is working are all real values. The real values are stored in memory as four bytes for the mantissa (*31* bits plus *1* bit for the sign of the number) with one byte being used for the exponent.

As all the computations are made in "floating point" mode, where the term floating point means what we have termed "real" values, there have to be procedures for converting from one type of value to another.

Examining *Preg* (pages 310-313) shows that at locations *3* and *4* there is a pointer (*Adray1*) to the routine which converts floating point numbers to integers, and at *5* and *6* there is a pointer (*Adray2*) to the integer to floating point routine. The need to convert from integer to floating point values explains why the use of integer variables usually slows down programs.

At location *13* there is a flag (*Valtyp*) to whether the current data type is string or numeric and, if numeric, location *14* (*Intflg*) indicates whether the number is integer or floating point.

In the two bytes at locations *20* and *21* are stored intermediate (ie temporary) integer values, and the routines to which we have just referred (ie pointers *Adray1* and *Adray2*) use this temporary storage location (*Linnum*). The routines also use a temporary storage location for floating point values which is called the floating point accumulator.

Actually there are two floating point accumulators (*#1* and *#2*) and the floating point numbers stored in these locations are held in a different manner to normal floating point values. Floating point accumulator *#1* is held at locations *97* to *102*. The way in which the value is stored is this

LOCATION	DESCRIPTION
97	Exponent
98-101	Mantissa
102	Sign byte

and the order is exactly the same for floating point accumulator *#2*, which extends from location *105* to location *110*.

You will observe that this differs from the way numbers are stored in memory by the addition of an extra byte, the "sign byte". There is also one byte given over to storing any overflow digits from *#1* (at location *104*) and one byte used for rounding of the value in *#1* (location *112*).

After using the accumulator the resulting number is deemed to be negative if the sign bit for the number and the sign byte both indicate a negative result. In the coding of the mathematical routines on the 64 (and so I have discovered the Vic20) errors have been made with checks on overflows and underflows. These errors have resulted in the sign comparisons being corrupted. If you

```
PRINT 2^(-128)
```

the answer is zero, but to

```
PRINT 2^(-127)/2
```

— which is effectively the same, because *2^(−128) = 2^(−127)/2* — is to produce the result *2.93873588E−39*.

Through these bugs might seem trivial, they do cast doubt on some of the other mathematical routines used in the 64. If the 64 is to be used for serious purposes these bugs need eradicating.

If the 64 is programmed using machine code these routines will not affect results unless the Basic floating point routines are used from within machine code. ■

This is an extract from Boris Allan's forthcoming book *Pocket Guide to the CBM64* to be published by Pitmans.

OPEN FORUM

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Shapes

on Spectrum

This program was written in conjunction with the local primary school. It is essentially a computer version of the popular 'matching shapes' toy and makes use of the Spectrum's high resolution graphics to draw shapes randomly selected, on the screen. No experience with computers is assumed.

You are allowed two tries at the answer before it is revealed. A correct answer gives a large tick.

Program notes

30	Sets screen colour
35-60	Sets variables
75-110	Draws screen
120-130	Correct response
140-179	Main response
180-180	Correct answer
200 210	Wrong answer
1000-1910	Shapes subroutine
2000-2100	Point plot
3000-3150	Random numbers
3500 3590	Tick
4000-4080	Draw cross
6000-6160	Flash shape
6200-6470	Fill shape
8500 8990	Instructions and Save routine

```
  10 REM SHAPES
  20 REM © J.S.M.ASHWORTH
              21/1/83
  25 GO TO 35
  30 BORDER 0  POKE 23693,7  CLS
   GO SUB 8500
  35 LET go=0  LET key=0  DIM p(
4,2)  IF p(1,1)<>168 THEN GO SUB
 2000
  60 LET r1=INT (RND*10)+1  LET
ox=24  LET oy=40  LET f=1  GO SU
B 900+(100*r1)  REM PICK SHAPE
  70 GO SUB 3000
  75 [illegible]
  76 FOR z=16 TO 120  PLOT z,0
 DRAW 0,1[illegible]  NEXT z
  77 PLOT 208,14  DRAW 0,160  PL
OT 158,96  DRAW 97,0
  80 LET f=1/3  PRINT AT 2,22;"1"
  LET ox=168  LET oy=128  GO SU
B 900+(100*a(s(1)))
  90 PRINT AT 8,29;"2"  LET ox=2
28  LET oy=128  GO SUB 900+(100*
a(s(2)))
 100 PRINT AT 19,22;"3"  LET ox=
168  LET oy=40  GO SUB 900+(100*
a(s(3)))
 110 PRINT AT 19,29;"4"  LET ox=
228  LET oy=40  GO SUB 900+(100*
a(s(4)))
 120 FOR z=1 TO 4  IF r1=a(s(z))
 THEN LET ans=z  REM FIND RIGHT
ANSWER
 130 NEXT z
 140 REM WAIT FOR RESPONSE
 150 IF INKEY$="" THEN GO TO 150
 155 IF INKEY$="STOP" THEN CLS
  STOP
 160 LET co=CODE INKEY$-48
 170 IF co<1 OR co>4 OR co=key T
HEN GO TO 150
 180 IF co=ans THEN GO SUB 3500
 GO SUB 6000  FOR c=1 TO 200  NE
XT c  LET go=0  CLS  RANDOMIZE
  GO TO 35
 200 LET go=go+1  IF go=2 THEN G
O SUB 4000  GO SUB 6200  LET go=
0  FOR c=1 TO 600  NEXT c  CLS
 RANDOMIZE  GO TO 35
 210 GO SUB 4000  BEEP 1,-30  GO
 TO 150
 999 REM SHAPE SUBROUTINES
1000 PLOT ox+(6*f),oy+(16*f)  DR
AW 0,80*f  DRAW 0,-80*f,-PI
1010 RETURN
1100 PLOT ox,oy  DRAW 50*f,0  DR
AW -50*f,120*f  DRAW 0,-120*f
1110 RETURN
1200 PLOT ox-(20*f),oy+(24*f)  D
RAW 80*f,0  DRAW 0,80*f  DRAW -8
0*f,0  DRAW 0,-80*f
1210 RETURN
1300 PLOT ox,oy  DRAW 70*f,0  DR
AW 0,120*f  DRAW -70*f,0  DRAW 0
,-120*f
1310 RETURN
1400 PLOT ox,oy+(30*f)  DRAW 70*
f,0  DRAW -35*f,((TAN (PI/3))*35
)*f  DRAW -35*f,(-(TAN (PI/3))*3
5)*f
1410 RETURN
1500 PLOT ox,oy  DRAW 40*f,40*f
 DRAW 0,54*f  DRAW -40*f,40*f  D
RAW 0,-134*f
1510 RETURN
1600 PLOT ox,oy  DRAW 40*f,40*f
 DRAW 0,88*f  DRAW -40*f,-40*f
 DRAW 0,-88*f
1610 RETURN
1700 PLOT ox+(24*f),oy  DRAW 32*
f,80*f  DRAW -32*f,32*f  DRAW -3
2*f,-32*f  DRAW 32*f,-80*f
1710 RETURN
1800 PLOT ox+(30*f),oy  DRAW 50*
f,50*f  DRAW -50*f,50*f  DRAW -5
0*f,-50*f  DRAW 50*f,-50*f
1810 RETURN
1900 CIRCLE ox-(8*f)+(94*f),oy+(
80*f),40*f
1910 RETURN
2000 RESTORE 2090
2010 FOR c=1 TO 4  FOR z=1 TO 2
2020 READ p(c,z)  NEXT z  NEXT c
2090 DATA 168,128,228,128,168,40
,228,40
2100 RETURN
2990 REM CHOOSE 1-4 IN RANDOM
         ORDER
3000 DIM s(4)
3010 FOR c=1 TO 4
3020 LET rn=INT (RND*4)+1
3030 LET s(c)=rn
3040 FOR z=1 TO c-1
3050 IF s(c)=s(z) THEN GO TO 302
0
3060 NEXT z
3070 NEXT c
3100 DIM a(4)  LET a(1)=r1
3110 FOR c=2 TO 4
3120 LET rn=INT (RND*10)+1
3130 LET a(c)=rn
3140 FOR z=1 TO c-1
3150 IF a(c)=a(z) THEN GO TO 312
0
3160 NEXT z
3170 NEXT c
3190 RETURN
3500 REM DRAW TICK
3505 LET ink=RND*4+3  FOR z=64 T
O 72  PLOT 12,z  DRAW INK ink,28
,-28  NEXT z
3510 FOR z=38 TO 42  PLOT z,40
DRAW INK ink,48,110  NEXT z
3520 PRINT AT 21,3  INVERSE 1,"
Good
3590 RETURN
3999 REM DRAW CROSS
4000 LET key=co
4005 LET ink=RND*4+3
4010 FOR c=p(co,1)-16 TO (p(co,1
)+3)-16
4020 PLOT c+8,p(co,2)-16  DRAW I
NK ink,30,63
4030 NEXT c
4050 FOR c=p(co,1)+14 TO (p(co,1
)+3)+14
4060 PLOT c+8,p(co,2)-16  DRAW I
NK ink,-30,63
4070 NEXT c
4080 RETURN
6000 REM FLASH SHAPE
6005 FOR c=20 TO 50
6010 BEEP .01,c  NEXT c
6050 FOR c=1 TO 5
6060 BEEP .05,c*5
6070 LET f=1/3  LET ox=p(ans,1)
 LET oy=p(ans,2)
6100 INK 0  GO SUB 900+(100*r1)
 FOR z=1 TO 10  NEXT z
6110 INK 7  GO SUB 900+(100*r1)
 FOR z=1 TO 10  NEXT z  NEXT c
6150 RETURN
6200 REM FILL IN RIGHT SHAPE
6205 FOR c=20 TO -20 STEP -1  BE
EP .005,c  NEXT c
```


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```
6210 GO TO 6250+ans*50
6300 FOR c=p(ans,1)-14 TO p(ans,
1)+33
6310 PLOT c,p(ans,2)-32  DRAW OV
ER 1,0,78
6320 NEXT c  RETURN
6350 FOR c=p(ans,1)-19 TO p(ans,
1)+27
6360 PLOT c,p(ans,2)-32  DRAW OV
ER 1,0,78
6370 NEXT c  RETURN
6400 FOR c=p(ans,1)-10 TO p(ans,
1)+39
6410 PLOT c,p(ans,2)-25. DRAW OV
ER 1,0,81
6420 NEXT c  RETURN
6450 FOR c=p(ans,1)-19 TO p(ans,
1)+27
6460 PLOT c,p(ans,2)-25  DRAW OV
ER 1,0,81
6470 NEXT c  RETURN
6500 REM INSTRUCTIONS
6505 PRINT PAPER 1;AT 0,0;"    P
ROGRAM INFORMATION FOR
   MATCHING SHAPES
6510 PRINT ' PRINT "  A large sh
ape is shown on the left-hand si
de of the screen,",
6520 PRINT "   four small number
ed shapes      appear on the rig
ht.
6530 PRINT   PRINT "  When the c
hild has made his   choice he pr
esses the            appropriate
key.
6540 PRINT   PRINT "  Two attemp
ts are allowed       before the c
orrect answer is     given."
6550 PRINT   PRINT "  The progra
m continues          indefinitely
. It can be stopped by pressing
SYMBOL SHIFT & "A"  when the com
puter is waiting fora response.
To restart press RUNand BREAK."
6580 PRINT #0; INK 5, BRIGHT 1,"
Press any key to start program."
  PAUSE 1  PAUSE 0  CLS  RETURN

9999 SAVE "SHAPES" LINE 30
```

Shapes
by J Ashworth

Quick Way Home

on TI99/4A

This program calculates mathematically the 'line of best fit' for a set of points plotted on a graph. It is written on a TI99/4A but should be easy to convert to other machines as no graphics are involved.

Program notes

190-270	Inputs the data and performs calculations on the initial data
280-300	Perform the final calculations
330	Prints the result in the form of an equation from which two plots can be calculated and the straight line drawn

```
100 CALL CLEAR
110 PRINT "REGRESSION ANALYSIS"
120 PRINT "-------------------"
130 PRINT "METHOD OF LEAST SQUARES        (LINEAR REGRESSION)"
140 PRINT
150 PRINT "Y=MX+C"
160 PRINT TAB(5);"M=GRADIENT"
170 PRINT TAB(5);"C=INTERCEPT ON Y AXIS"
180 PRINT
190 PRINT "INPUT X,Y  (999,999 TO END)"
200 INPUT X,Y
210 IF X=999 THEN 280
220 CUMX=CUMX+X
230 CUMY=CUMY+Y
240 CUMXY=CUMXY+(X*Y)
250 CUMXSQ=CUMXSQ+(X^2)
260 T=T+1
270 GOTO 200
280 IF Y=999 THEN 290 ELSE 220
290 M=((T*CUMXY)-(CUMX*CUMY))/((T*CUMXSQ)-(CUMX^2))
300 C=(CUMY/T)-(M*CUMX/T)
310 PRINT
320 PRINT "ANSWER:"
330 PRINT "Y=";M;"*X+";C
340 END
```

Quick Way Home
by Christopher Jackson

Catch

on Vic20

This is a game program for the unexpanded Vic It is a game for two players Player 1 uses the keyboard and player 2 uses the joystick The object is to catch the ball which appears in the centre of the screen To catch the ball you must move your man to the ball and place it on top This is made harder by the fact that the ball is moving! The joystick only moves up, down, left and right and so does the keyboard The keys are as follows
P = up, L = left = down, . = right

Program notes

1-32	Prints please wait and sets the graphics
40-61	Sets variables
90-91	Finds a random position on the screen for ball
100-106	Puke characters on to screen
110-127	Get keyboard and joystick values Checks if character has gone off the screen and corrects
128-130	Clear off characters
131-135	Move player 1
136	Play note
137 145	Move ball randomly
146	Turns off note.
147	Checks if player 1 has won
148	Checks if player 2 has won
150-154	Move player 2
400-499	Print player 1 has won
500 580	Print player 2 has won and tell if another game is wanted

```
1 PRINT"␣PLEASE WAIT"
2 POKE36369,255
3 POKE650,255
4 POKE36878,15
9 POKE52,28 POKE56,28
10 FORA=7168TO7679 POKEA,PEEK(A+25600) NEXT
20 FORA=7384TO7384+23 READB POKEA B NEXT
30 DATA129,66,36,24 24,36 66,129
31 DATA24,24,24,255 255,24,24,24
32 DATA0,60,126,126,126,126,60,0
40 PRINT"PRESS ANY KEY TO START"
50 GETA$ IFA$=""THEN50
55 PRINT"␣"
60 A1=22 A2=22
61 B1=0 B2=21
90 C1=INT(RND(1)*22)
91 C2=INT(RND(1)*22)
100 POKE7680+(A1*22)+B1,27
101 POKE7680+(A2*22)+B2,28
102 POKE7680+(C1*22)+C2,29
104 POKE7680+(A1*22)+B1+30720,0
105 POKE7680+(A2*22)+B2+30720,0
106 POKE7680+(C1*22)+C2+30720,2
110 GETA$
111  POKE37139,128 G=PEEK(37151) POKE37154,
     127 G=G+PEEK(37152) POKE37154,255
120 IFA1>22THENA1=22
121 IFA2>22THENA2=22
122 IFA1<0THENA1=0
123 IFA2<0THENA2=0
124 IFB1>21THENB1=21
125 IFB2>21THENB2=21
126 IFB1<0THENB1=0
127 IFB2<0THENB2=0
128 POKE7680+(A1*22)+B1,32
129 POKE7680+(A2*22)+B2,32
130 POKE7680+(C1*22)+C2,32
131 IFA$="P"THENA1=A1-1
132 IFA$="."THENA1=A1+1
133 IFA$="L"THENB1=B1-1
134 IFA$=","THENB1=B1+1
135 GOSUB150
136 POKE36876,200
137 J=INT(RND(1)*4)
138 IFJ=0THENC1=C1-1
139 IFJ=1THENC1=C1+1
140 IFJ=2THENC2=C2-1
141 IFJ=3THENC2=C2+1
142 IFC1<0THENC1=0
143 IFC1>22THENC1=22
144 IFC2<0THENC2=0
145 IFC2>21THENC2=21
146 POKE36876,0
147 IFA1=C1ANDB1=C2THEN400
148 IFA2=C1ANDB2=C2THEN500
149 GOTO100
150 IFG=369THENA2=A2-1
151 IFG=365THENA2=A2+1
152 IFG=357THENB2=B2-1
153 IFG=245THENB2=B2+1
154 RETURN
400 PRINT"PLAYER NO. 1 WON"
401 POKE36869,240
499 GOTO550
500 PRINT"PLAYER NO. 2 WON"
501 POKE36869,240
550 PRINT"ANOTHER GAME"
555 POKE198 0
560 GETA$ IFA$=""THEN560
570 IFA$="Y"THENPOKE36869 255 GOTO55
575 IFA$<>"N"THEN555
580 POKE36869,240
READY.
```

Catch
by Darron Farrow

Run Around

on ZX81

The object of this game is to move around the grey part of the screen and eat the white squares as they appear You are represented as an I or v if you are moving up or down and as a < or > if you are moving left or right The grey area also fills up with black squares if these are 'eaten' the game will end, giving the score, eating the edges of the screen will also end the game The cursor control keys change the direction that you move in and once pressed, you will continue to move in that direction until you press another key

In line 20 the graphics are - Graphics space, 30 Graphics H s followed by a Graphics space In line 100 the graphic is a Graphic A

```
RUN AROUND
   1 LET S=0
  10 FOR I=1 TO 22
  20 PRINT "████████████████████
████████"
  30 NEXT I
  40 FOR I=1 TO 31
  50 PRINT AT 0,I,"█",AT 21,I,"█
"
  60 NEXT I
  70 LET Y=10
  80 LET X=10
  90 LET A$="1"
 100 PRINT AT Y,X,"█"
 101 IF INKEY$="5" THEN LET A$="
<"
 110 IF INKEY$="8" THEN LET A$="
>"
 120 IF INKEY$="7" THEN LET A$="
1"
 130 IF INKEY$="6" THEN LET A$="
V"
 150 IF A$="1" THEN LET Y=Y-1
 160 IF A$="V" THEN LET Y=Y+1
 170 IF A$="<" THEN LET X=X-1
 180 IF A$=">" THEN LET X=X+1
 181 GOSUB 1000
 190 PRINT AT Y,X,A$
 200 GOTO 100
1000 LET P=(PEEK (16398)+256*PEE
K (16397))
1010 LET P=P+1+(Y*33)+X
1020 IF PEEK (P)=128 THEN GOTO 3
000
1030 IF PEEK (P)=0 THEN LET S=S+
1
1040 GOSUB 2000
1050 RETURN
2000 PRINT AT RND*19+1,RND*30+1;
" "
2010 PRINT AT RND*20,RND*31,"█"
2020 RETURN
3000 PRINT AT 10,10,"██████████
████"
3010 PRINT TAB 10,"██████████",
S
```

Run Around
by E Smith

Demos

on BBC

This is an interesting demonstration of the BBC's graphic capabilities. It will only run on the Model B as it uses modes 1 and 2 for the five demonstrations.

The first demo is a complicated flashing string pattern, the second a simpler but similar version. The third is derived from triangles, the fourth a multi-colour flower and the fifth a multi-coloured spiral. Press q to exit from the program.

```
10 MODE2
15 PROCF2
20 DRAW0,400:DRAW0,800:DRAW600,800:GCOL0,9:
   PLOT85,0,400:MOVE1200,800:DRAW1200,400:GCOL0,
   11:PLOT85,600,800:MOVE1200,400:DRAW1200,0:
   DRAW600,0:GCOL0,14:PLOT85,1200,400:MOVE0,0:
   DRAW0,400:GCOL0,12:PLOT85,600,0
30 PRINTTAB(2,2);"GRAPHICS DEMO."
40 PRINTTAB(8,12);"By"
50 PRINTTAB(6,15);"NICHOLAS"
60 PRINTTAB(7,17);"SHORT"
65 G$=GET$
70 CLS:MODE7
80 PRINTTAB(4,1);CHR$129;CHR$141;"GRAPHICS DEMO.
   ";PRINTTAB(4,2);CHR$129;CHR$1
   41;"GRAPHICS DEMO."
90 PRINT CHR$131"Choose a number corresponding
   with one"
100 PRINTCHR$131;"of the following graphics "
110 PRINTCHR$131;"demonstrations below."
120 PRINT CHR$130;"To leave the program
   press  9"
130 PRINT CHR$133;"To return to this sheet
   after a"
140 PRINTCHR$133;"graphics routine hit any key"
150 PRINT CHR$130;"1) ---- ";CHR$132;"
   STRING PATTERN 1"
160 PRINTCHR$130;"2) ---- ";CHR$132;"STRING
   PATTERN 2"
170 PRINTCHR$130;"3) ---- ";CHR$132;"TRIANGLES"
180 PRINTCHR$130;"4) ---- ";CHR$132;"FLOWER"
190 PRINTCHR$130;"5) ---- ";CHR$132;"SPIRAL"
300 INPUT "YOUR CHOICE",D
305 IF D=9 GOTO 3000
310 IF D<1 OR D>5 GOTO 300
320 IF D=1 GOTO 500
330 IF D=2 GOTO 1000
340 IF D=3 GOTO 1500
350 IF D=4 GOTO 2000
360 IF D=5 GOTO 2500
370 IF D=9 GOTO 3000
500 MODE1
510 VDU5
520 C%=1:F%=RND(5)
530 VDU29,640;512;
540 MOVE0,0
550 FOR A=0 TO 125 STEP0.2
560 GCOL0,1+(3.4*A+3)MOD3
570 DRAW 3.5*A*SIN(A*10),2*A*COS(A*10)
580 FOR I%=1 TO 1.5
590 VDU19,I%,(C%+I%)MOD3+F%;0;
600 NEXT
610 C%=(C%+1)MOD3
620 NEXT
630 PRINTTAB(7,30);"HIT A KEY"
640 G$=GET$:GOTO70
1000 MODE1
1010 VDU5
1020 GCOL0,RND(3)
1030 S%=400
1040 VDU29,640;512;
1050 MOVE0,0
1060 FOR A=0 TO 33  STEP0.1
1065 GCOL0,RND(3)
1070 DRAW S%*SIN(A*20),S%*COS(A)
1080 NEXT
1090 PRINTTAB(7,30);"HIT A KEY"
1100 G$=GET$:GOTO70
1500 MODE5
1530 VDU19,3,4,0,0,0
1540 T=0
1550 S=1000
1560 H=1.732*S/2
1570 REPEAT
1580 B=S-T*250
1590 U=H*T/4
1600 X=100+250*T/2
1610 Y=U/2+100
1620 PROCT(X,Y,B,T MOD 3+1)
1630 T=T+1
1640 UNTIL T>B
1650 G$=GET$:GOTO 70
1660 DEFPROCT(x,y,l,c)
1700 LOCAL h
1710 GCOL0,c
1720 h=l*1.732/2
1730 MOVEx,y
1740 DRAW x+l,y
1750 DRAW x+l/2,y+h
1760 DRAW x,y
1770 ENDPROC
2000 MODE2
2010 VDU29,640;512;
2020 MOVE0,FNF(0)*500
2030 FOR A=0 TO 360
2040 MOVE0,0
2050 GCOL0,RND(7)
2060 DRAW SIN(RAD(A))*FNF(A),COS(RAD(A))*FNF(A)
2070 NEXT A
2075 G$=GET$:GOTO 70
2080 END
2090 DEF FNF(X)=500*SIN(RAD(X*8))
2500 MODE2
2510 VDU29,640;512;
2520 R%=512:C%=1
2530 A%=10
2540 MOVE R%,0
2550 REPEAT
2560 MOVE0,0
2570 GCOL0,C%
2580 PLOT 85,COS(RAD(A%*2))*R%+5,SIN(RAD
   (A%*2))*R%+5
2590 C%=C% MOD 3+1
2600 A%=A%+10
2610 R%=R%-4
2620 UNTIL R%<0
2630 G$=GET$:GOTO70
3000 MODE2
3010 DRAW0,400:DRAW0,800:DRAW600,800:GCOL0,
   9:PLOT85,0,400:MOVE1200,800:DRAW1200
   ,400:GCOL0,11:PLOT85,600,800:MOVE1200,400:
   DRAW1200,0:DRAW600,0:GCOL0,14:PLOT85,1
   200,400:MOVE0,0:DRAW0,400:GCOL0,12:PLOT85,
   600,0
3020 PRINTTAB(5,2);"GRAPHICS DEMO."
3030 PRINTTAB(6,17);"GOODBYE!"
3040 PROCF
3050 DEFPROCF:RESTORE4000:FOR I%=0 TO 13:READM1,
   M2:SOUND2,-13,M1,M2:SOUND3,-13,
   M1+48,M2:SOUND2,-13,M1+96,M2:SOUND&1001
   0,0,0:NEXT:ENDPROC
3060 DEFPROCF2:RESTORE5000:FOR I%=0 TO 13:READM1,
   M2:SOUND2,-13,M1,M2:SOUND1,-13 ,M1+48,M2:
   SOUND2,-13,M1+96,M2:SOUND&1001,0,0,0:NEXT
   :ENDPROC
4000 DATA81,4,77,4,81,4,61,4,81,4,77,4,81,4,61,
   4,33,4,33,4,41,4,41,4,49,8,49,4,
   49,4,41,4,41,4,33,16
5000 DATA 53,4,69,4,81,4,69,4,73,4,61,4,69,8,
   53,4,41,4,25,4,41,4,33,4,49,4,53,8
>5010 END
>VDU3
```

Demos
by Nicholas Short


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Kaleidoscope

on Vic20

Kaleidoscope requires no special graphics or CRSR controls. All that needs to be changed are the variables

TL — top left of VDU. SD — screen depth. SL — screen length, RW — the X, BD — half density block, OB — filled circles if the space key is pressed then the screen stops. If you press space again it will carry on. If you press s then the program will stop

```
5 GOTO99
10 POKE36878,15
20 FORT=0TO255
30 POKE36877,T
40 POKE36876,T
50 NEXTT
60 POKE36878,0 POKE36877,0
   POKE36876,0
70 RETURN
80 POKE36878,15
82 FORT=15TO0STEP-3
84 POKE36877,T
85 POKE36876,T
87 NEXTT
89 POKE36878,0 POKE36877,0
   POKE36876,0
90 RETURN
99 GOSUB10
100 POKE36879,92
110 TL=7680
120 SD=23
130 SL=22
140 TR=TL+(SL-1)
150 BL=TL+((SD-1)*SL)
160 BR=BL+(SL-1)
170 RW=86
180 BD=102
190 OB=98
200 FORX=1TOSD/2
210 PRINT
220 NEXTX
221 GOSUB10
230 PRINTTAB((SL-12)/2)"KALEIDOSCOPE"
240 PRINT PRINT
260 PRINTTAB((SL-12)/2-1)"
    BY W.R.CLEMENTS"
270 FORX=1TOSD/2
280 PRINT
290 NEXTX
300 FORX=1TO1500
310 NEXTX
311 GOSUB10
320 PRINT"DO YOU WANT A NEGATIVEOR
    POSITIVE"
330 PRINT
340 PRINT"KALEIDOSCOPE EFFECT (N/P) ?"
350 FORX=1TOSD/2
360 PRINT
370 NEXTX
380 GETNP$
390 IFNP$="N"THEN420
400 IFNP$="P"THENGOSUB900 GOTO460
410 GOTO380
420 GOSUB900
430 FORNL=TLTOBR
440 POKENL,RW
450 NEXTNL
460 FORPL=TLTOTR
470 POKEPL,BD
480 NEXTPL
490 FORPL=TLTOBLSTEPSL
500 POKEPL,BD
510 POKEPL+(SL-1),BD
520 NEXTPL
530 FORPL=BLTOBR
540 POKEPL,BD
550 NEXTPL
560 LC(1)=TL
570 LC(2)=TR
580 LC(3)=BL
590 LC(4)=BR
600 D1(1)=1
610 D1(2)=-1
620 D1(3)=1
630 D1(4)=-1
640 D2(1)=SL
650 D2(2)=SL
660 D2(3)=-SL
670 D2(4)=-SL
680 XX=INT((SL-1)/2)
690 YY=INT((SD-1)/2)
700 GOSUB80 FORX=1TO4
710 L2(X)=LC(X)
720 NEXTX
730 X=INT(XX*RND(1)+1)
740 Y=INT(YY*RND(1)+1)
750 FORZ=1TO4
760 L2(Z)=L2(Z)+((X*D1
    (Z))+(Y*D2(Z))
770 NEXTZ
780 IFPEEK(L2(1))<>OBTHENCR=OB
    GOTO800
790 CR=RW
800 FORZ=1TO4
810 POKEL2(Z),CR
820 NEXTZ
830 GETGG$
840 IFGG$<>" "THEN890
850 GETGG$
860 IFGG$=" "THEN890
870 IFGG$="S"THENGOSUB940 END
880 GOTO850
890 GOTO780
900 GOSUB10 FORX=1TOSD/2
910 PRINT
```



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930 RETURN
940 FORX=1TO50
950 PRINT
960 NEXTX
970 RETURN
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by William Clements

Microradio

GW6JJN

Teletext info

This week I would like to float an idea that I have had for some time and maybe get some reaction from readers. As you are aware, the BBC and ITV services transmit teletext called Ceefax and Oracle. The equipment to receive their transmissions is built into the tv receiver, or as an expensive add-on for the BBC micro. It occurred to me that this is an excellent way of transmitting information, no expensive equipment is required, just your micro and a radio transceiver.

I have been sent a program by Iain Stewart, 17 Torry Drive, Alva, Scotland FK12 5NQ, for the Spectrum called ZXText. It costs £4.95 and allows you to build your own teletext pages. The information on each page is entirely up to the user and graphics are supported.

It is quite simple to build up as many pages as you have memory for with any details you wish. The sort of thing that springs to mind is club details, written information regarding your station and QSL details, even log information. When the pages are written and the program is run, then one can set the clock and the date, write a contents page and play with the program as much as you like.

The whole thing can be saved to audio tape and then transmitted to your friends either on FM or any other suitable mode. The only stipulation in the licence is to give your callsign at least every 15 minutes in voice. I don't think I've come across a program that takes 15 minutes to send or load, so there's no problem.

When the program is downloaded at the other end, it can be loaded into the micro and the pages displayed. They can then be changed or amended and sent back. Conversations in colour and graphics make RTTY seem old fashioned. The next stage is to use this system on a Micronet-type modem system over the air so that the pages can be updated by all those taking part. This is possible on the Spectrum with the arrival of Interface one.

RS232 information can also be passed as easily as any other, providing a modem is used. VHF/FM is more sophisticated than the phone lines and less likely to end up in the "Wargames" situation, unless ... well, there are some strange sounds on the airwaves these days. ■

Ray Berry GW6 JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share, or topics that you would like to see covered, write to Ray Berry, Microradio, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD



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SAGA

A couple of updates this week to previous comers. First of all, a clutch of new books about computer assisted Adventuring have recently been released.

For the Commodore 64 and Vic20 Pete Gerrard, who along with brother Mike, seems sometimes to corner the computer periodicals, has written *Exploring Adventures on the Commodore 64/Vic20*. A cassette of the three full-length programs from the two books are also available.

I haven't seen either yet but although the combined price is a little high, Gerrard always makes entertaining reading so they will be worth investigating.

Aimed at the younger Adventurer and would-be Adventure programmer is *Write Your Own Adventure Programs* by Jenny Tyler and Les Howarth. This is another in Osborne's computer series and covers a wide range of computers.

The book is in large paperback format with colourful diagrams and clear text. Actually, more experienced programmers would find a lot to interest them here and the book is well worth the modest price.

And now an update to the Scott Adams profile. Thanks to the Silica Shop I have recently seen a SAGA. A Scott Adams Graphic Adventure, that is! From the 12 original text Adventures so far available, Adventure International have selected six to enhance with graphics. They are available on disc for the Apple and Atari machines.

I have *Pirate Adventure* for review and although I haven't seen the original, I believe that the scenario is the same. At the start the Adventurer finds him herself in a flat in London with a few items scattered around waiting to be picked up. There is a bottle of rum, a pair of sneakers and a sack of crackers.

The scene is depicted graphically in the upper half of the screen (the computer commentary and your commands take up the lower half in time-honoured tradition) and as you pick up or discard each object the display is updated accordingly.

Pressing *Enter* clears the picture, the upper area then shows a brief description of the location along with the objects currently there. If you have foolishly forgotten to get a light, it will remain blank, or even more infuriating, merely show a jumble of letters and symbols.

The graphics, designed by Ad Venture Graphics, do not always represent the location — you will come across the Pirate's Chest, for instance, and that will be displayed in its full glory. Stumble into a dark place and two great eyes will blink out of the gloom at you! Ask for an inventory of the objects carried by you and you will see yourself surrounded by those objects.

The graphics are nicely drawn but suffer adversely from the USA-UK translation. The different television systems play havoc with some of the colours (orange for instance becomes a vivid pink) and the lower half of the screen, for some reason, flickers alarmingly while processing your input.

All the usual commands are recognised in one or two word form (for example 'Help', 'Take bottle', 'Climb stairs' and so on) as well as 'Save game'. This command allows you to store up to four games on the disc and resume later at the same point. There is also a script character set available at the touch of a key — this is similar to real 'joined-up' writing, but rather difficult to read.

For those of you who have Scott Adam's Adventures No 1-6 these SAGAs are really a luxury as the actual Adventure is the same. But if you have yet to venture into Adamsworld, the Graphic Adventures are certainly worth including in your library. Unfortunately, it's unlikely that we'll see the programs on home-produced machines — it's a sad fact that no British product, even the mighty Sinclair, is sufficiently popular in the States to interest Adventure International in translating the Adventures.

Another new Spectrum Adventure released in the past couple of weeks is *Groucho*, from Automania. This, as if you didn't know, apart from being the company that perpetrates some excruciating humour on the back of this magazine, also unleashed *Pimania* upon the unsuspecting public. To date, the Golden Sundial is still up for grabs by the first person to crack the secret in the program and turn up at the right place and the right time. There is also a prize to be won in the new Adventure and that is a trip to Hollywood.

Like *Pimania*, *Groucho* is written in Basic and the responses are S-L-O-W, rather like watching custard cooling. Also like the previous program, *Groucho* is devoid of violence (except from the player). As far as I've got, the idea seems to be to visit various locations, depicted in lo-res graphics using the Spectrum's coarse character set, and work through the puzzles at each point.

By the time you read this, some of you may have got well into the Adventure, so, if you'd like to share your experiences, write to me c/o *PCW*.

Finally, my thanks to Ken Bolton of Yarnton in Oxfordshire. He writes to tell me that anyone who saw *The Omen* on tv recently may now know 'the number of the Beast', which is one of the clues *Black Crystal*. For those of you who, like me, couldn't bear to watch, he also suggests looking in Revelations, Chapter 13, verse 18. ■

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to Tony Bridge, Adventure Corner, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

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FORTH PROBLEMS

Danny Douglas of Valmy Road Tooting writes

Q **I have got a *Forth* program for my Spectrum, but am having problems with the manual enclosed, because it does not say much about the language. I wonder if you know of any good books that might help me?**

A Steven Vicker's book *Forth Programming* which was used as the Ace manual is a good introduction, and available separately. Also worth reading is *Discover Forth* by Tom Hogan. This is published by Osborne/McGraw-Hill. Leo Brodie has a book published by Prentice-Hall called *Starting Forth*. And another to look for is *Introduction to Forth* by Ken Knecht.

REBEL KEYS

J D Moore of Leigh Way, Weaverham, Northwhich, Cheshire, writes

Q **I own a 48K Spectrum, which up until now has worked perfectly. However, recently several keys (B, N, M, P and both *Enter* keys), have started to rebel and hardly ever work. Could you please tell me what is wrong, and how I should go about conquering the problem.**

A If your Spectrum is still under guarantee then return it at once to have the keyboard replaced. If it is out of guarantee then you will have to decide either to get it repaired or else to buy a real keyboard.

The Spectrum keyboard is, in fact just a larger version of the ZX81 membrain type, with slightly better keys. What has happened is that one of the contacts has worn. This means that one entire data or address line is either returning wrong values, or no values at all. If you want to try and get it repaired you might try contacting TV Services, Chesterton Mill, French's Road, Cambridge CB2 3NP — they specialise in repairing ZX81s and ZX Spectrums. You might find though that instead of replacing the existing keyboard that you want to fit a new one. There are several available and they are simple to fit.

If you decide on this option, it might well be worth waiting a little while until a keyboard case is bought out which can accept the Interface 1.

CHEAP PRINTER

Mr J A Avery of Tudor Drive, Yateley, Hants writes

Q **I have a 48K Spectrum and at the moment I am searching for an inexpensive printer. All that seems to be available is the ZX printer which does not have the print quality required, or else the £300-plus units that are too expensive.**

A Printers suddenly seem a very popular subject. For your price range there are really only two companies to consider, Seikosha and Epson. Apart from the ZX Printer, the only other very cheap printers are the Amber and the Tandy CGP 115. Neither use full size paper, though the Tandy which uses half the normal size paper does print in four colours. In all these cases a special interface will have to be added to the Spectrum.

For full size letter quality print (will print letters anyway), the three printers to look for are the Seikosha 100, which you might get for as little as £175. The Seikosha 250, which is approximately £250, and the Epson RX80, which is about £250. The early Epson MX80 seems to be fading off the scene, and this is a model that you are most likely to find being sold secondhand. It is important before you buy a printer to think what you want from it. The Epson RX is more flexible when it comes to print styles, featuring such things as double strike, but it has a fixed tractor feed. The Seikosha comes with a variable feed as standard. This allows you to use different widths of paper — important, if for example, you want to use address labels.

Besides the printer you will need an Interface. On the interface 1 there is an RS232 port. None of these printers has an RS232 as standard. Indeed printers seem to be concentrating on Centronics interfaces. If you have Interface 1 then you will need to get a special RE232 adapter for your printer. This is expensive. I think you might find it cheaper to buy a Centronics Interface for your Spectrum. Kempston and Hilderbray both do one as does Tasman. ADS do one that incorporates a screen dump and is relocatable. When you buy your printer ensure that you can get a screen dump program for it. The Copy command only works on the ZX Printer.

As well as this you will also have to pay for paper but this should be under £15 as long as you buy a box of two thousand sheets. So to the cost of the printer you must add the cost of an interface and paper. The other obvious things to think about are a word processing program and a proper keyboard. Indeed if you want to use your Spectrum for word processing I would suggest that you start with a proper keyboard. After several hours the Spectrum keyboard does start to show its limitations.

IN RUSSIAN

David Millar of Park View Alloway Strathclyde writes

Q **I wonder if it is possible that you could tell me where I could purchase software for the Dragon concerning O-Grade (SCEEB) educational software. My computer is the Dragon 32 and I am interested in Russian, Latin, Greek, Maths and Sciences. O-Level would be a possible substitute.**

A I dealt with this only a few weeks ago in Issue 42. To up-date the information there I can add that Multisoft systems of 41 Copsleigh Close Salfords, Redhill Surrey, also has a Physics and Chemistry tutor available. I do not know specifically whether or not they are compatible with the SCEEB. As yet I have not seen any programs for the languages you want. Like the Spectrum and to a lesser extent the BBC, educational programs are lagging behind other sorts of software.

While up-dating previous answers, I will mention another company who has written to me after I dealt with Business software in September. Transform have written enclosing their catalogue. They are at 41 Keats House, Porchester Mead, Beckenham, Kent. They specialise in Spectrum and ZX81 business software. Their own programs include various day books, analysis and stock control. All of which come dubbed twice on a cassette, and will *Run* on full size printers. Besides these they also carry software from Tasman, Video, and Campbell.

DRAGON LIGHT PEN

P Peters of Winemat Close, Hanslope, Milton Keynes, Bucks writes

Q **I have a Dragon 32 and am looking for a light pen. I know that I have read about such a thing, and seen advertisements, but now I can't trace when or where I heard about it. Can you give me the address of someone who can supply one?**

A I can only think of one and that is by Microdeal, whose address is 41 Truro Road, St Austell, Cornwall PL25 5JE.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, PCW, 12-13 Little Newport Street, London WC2R 3LD.

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VIC20 CASSETTE with 16K Ram pack over £70 of software including 2 cartridges Astroids Defender Frogger Panic Frantic Blitz joystick sale £350 £180 ono Tel 078481 2518

VIC20 plus cassette unit 16 Ram music synthesizer Blitz CSE Educational programmes £120 ono Tel (0272) 738052

COMMODORE 64, for sale/swap for BBC Model B 1 2 OS sale £240 including joystick + cassette deck + arcade games + magazines + games book + 2 users manuals Tel 021 523 7617

SALE OR EXCHANGE Arfon 16K Vic memory cartridge cost £74 Wanted printer to use with Vic20, ZX or similar Peter Lee 863567

VIC20 cassette recorder all manuals + Intro to Basic programs joystick, super expander Blitz Hobbit Scramble only £120 for quick sale Tel 0788 205 158

VIC20 + 16K + 3K super expander + omega cartridge + joystick + book + software cost over £200 sell for £120 ono Only 12 months old Tel 0953 725850

VIC20 + Basic part I + 8 games 1 month old perfect condition £105. Tel 01-882 1545

VIC20 with cassette deck 8 games, carry case joystick and program aid cartridge £150 Tel 01 866 1753

VIC20 starter pac magazines + games £120 or swap for 48K Spectrum Tel 0702 540452 Paul (evenings only)

VIC20 6K cassette deck, joystick programmers reference guide magazines Gorf cartridge £65 of software all boxed £180 ono Phone Kettering (0536) 761072

VIC20 for sale plus cassette unit, Sea Battle cartridge and joystick tapes and magazines all boxed as new and still under guarantee £110 ono Tel Kingswinford 271202

ORIGINAL VIC20 SOFTWARE, 23 games plus joystick worth over £180 will sell together for £80 Tel Bill Day 01-854 3350

VIC20 STARTER KIT, including C2N cassette unit Introduction to Basic I games cassettes plus Golf cartridge plus joystick, £200 want £100 ono Tel 061-439 8152

VIC20 SOFT SWITCH Never used £19 Tel Aldridge 51923

VIC20 STARTER PACK including one game Brand new perfect condition, £100 Tel 01-882 1545

16K VIC20 plus C2N plus £130 of software plus books plus joysticks, £200 Tel J Massey Southampton 437921

VIC20, manual + wanters book, 16K Ram pack, 24 games joystick + tape recorder perfect condition £186 or any near offer Tel 061-881 4133

VIC from Ram with 3K Ram £20 + adventure cartridge £5. Tel 0383-734731

Dragons for sale

DRAGON 32 ... joystick and soft ware including Chess cartridge Sell for £180 or swap for Spectrum 48K including software Tel (0480) 64377 after 4 pm.

DRAGON 32 plus joysticks cassette and recorder Over £100 of software including Donkey King Katerpillar Attack etc Many Dragon magazines and book worth over £360 Sell for £240 Tel Bedford 57407

DRAGON 32. Pimania, Invaders Revenge Madness and the Minotaur Defender Phantom Slayer Toolkit Computavoice Calixo Island Alcatraz Wizard War Dragon Trek. All £3 50 each plus two joysticks £10 50 Apply 72 Southtown Road Yarmouth

DRAGON 32. Boxed joysticks books and the latest software plus two cartridges worth over £280 will accept £180 ono Tel Kings Lynn 71883

DRAGON 32 and 1 joystick software magazines (Dragon User) cassette recorder software tapes including The King Frogger Shuttle Dragon Trek, Nightflight, all leads 2 months old excellent condition £185 ono Tel Stevenage 355294

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DRAGON 32 boxed as new all leads all Dragon Users books magazines cassettes (Frogger and Champions) cost £230 quick sale £145 ono Phone Northwood (Malns) 28204 anytime

DRAGON SOFTWARE. swap or sell many games including Vulture Crusader Donkey King Defender etc Also one pair Dragon joysticks £8 Tel Peter Mold (0352) 59884 Mold Clwyd North Wales

DRAGON TAPE COPIER wanted for machine code and Basic programs to make back up of original programs on tape please 32 The Firs Mold Clwyd North Wales Tel Peter (0352) Mold 59884

DRAGON 32, perfect condition boxed as new still under guarantee plus softwares and joystick £120 ono or swap for a Lynx 48K Tel Barnes 741 7824 (after 5 pm)

DRAGON 32 joysticks over £60 of latest software Microdeal etc + Enter The Dragon Know Your Dragon and three Dragon User magazines, worth over £260 bargain at £135 ono Tel Leeds (0532) 852259

DRAGON 32 boxed with leads two joysticks tape recorder dust cover approx £100 worth of software and magazines Worth £280 sell for £180 Tel Wickford 88248

DRAGON 32 + books + £450 worth of software + joysticks £180 ono Tel 0245 329869

DRAGON 32 + joysticks and £100 of games £200 ono Tel 01 518 1788 (evenings only)

DRAGON 32, nine months old much software light pen joysticks still under guarantee many books value £475 accept £240 Tel 0634 270317

DRAGON 32 boxed completely with joysticks + £100 of games Sell for £170 Tel 021 360 1678

DRAGON 32, with joysticks tape recorder books magazines and over £80-worth of software including Donkey King and Ninja Warrior all for £180 ono Tel (0900) 3607

FOR SALE Dragon 32K included over £160 of software also joysticks books the manuals sell for £300 — in mint condition or swap for Spectrum 48K with similar accessories Tel 051-430 074

DRAGON 32, manual joysticks leads, etc plus £70+ of software including Ring of Darkness Katerpillar Planet Invasion + £80 of books magazines worth £350 sell for £200 ono Tel Swansea 401823

DRAGON 32 lots of software books tape recorder sell for £170 Tel 01 518 1409

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ATARI VCS paddles joysticks etc Space Invaders and Combat cartridges sell for £50 Tel 0325 (Darlington) 467407 anytime

ATARI 400 + joystick + Atari Basic cartridge £210 ono Tel 01 288 6794

ATARI VCS + five cartridges including Space Invaders Breakout £50 or swap for ZX printer paper Hobbit (+ book) or Valhalla or Interface 1 and microdrive or interface 2 and money Tel (021) 7729873

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ATARI 400 only four months old includes Basic programming kit also Galaxians cartridge and one joystick sell for £120 Tel Romford 89991

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Wanted

SWAP VIC20 or cassette software Tel 0602 324376 Weekdays evenings or all day Saturday or 0602 329569 any other time

4K GRAPHIC ROM plus software for ZX81 £15 also will swap 10 original Spectrum cassettes for hi soft Pascal Write to Clive Palmer 7 Turner Road Norwich NR2 4HD

WANT CARTRIDGES for Colevision preferably Turbo and Intellivision games systems 01-764 4075

SWAP £260 worth of s/w individually or total lot Tel 01 746 8178

WANTED Arfon expansion for a Vic20 (broken) Tel 041 332 1488

WANTED for Spectrum Printer TV sound adaptor light pen Wye Valley compiler Tel Tom 031-441 3068 evenings

SPECTRUM software swap I have Vu file Vu-calc Vu-3D Flight Simulator 48K Chess Swap for Hisoft Pascal Aberwolr Fenn Hobbit Offers to Phil Ward Morgan Hall The Lawns, Cottingham N Humberside

WANTED 64K Ram pack for ZX81 Tel Mr Leece 0753 74111

SWAP Flight Simulator ZX81 cassette perfect condition or sell! Offers to Mr Leece 30 Grainger Close Basingstoke Hants RG22 4DY Tel 0753 74111

64K ZX81 will buy or swap my 16K ZX81 with cash difference Tel 0753 74111 Mr Leece

SWAP SPECTRUM games ine Game Designer worth £84 for complete BMX wheels or sell for £35 Tel Great Harwood 884 788

WANTED Spectrum 48K + any s/w Lekkitecha 44 Aberdeen Road St Denys Southampton

SPECTRUM 48K with or without s/w and accessories 01 824 6797

WANTED TI memory expansion 2 Atari UCS joysticks mini memory module editor assemble + Funnels Doom module Steven at Beaconsfield (04946) 6809

SWAP Spectrum 48K + printer + s w for Oric 48K with s/w Tel 01 998 6065

WANTED Sinclair ZX81 or equivalent Tel Stuart Truro 78932 (day) Tregary 210 (evenings)

WANTED ZX81 with instructions (London area) Tel 01 505 3819 evenings only

SWAP Commodore Adventureland and Pirate Cove adventure games for any other cartridges for the Vic20 Tel 031 339 2000 Alexander Steeles

WANTED Aoborun Power Blaster etc for Lynx Will swap for invaders or pay £3 each Tel Twyford (Hants) 713771

WANTED EG2000 colour genie plus some good software to swap for 48K Spectrum plus quickshot joystick and over £100 of eval games Will swap for eval offer Tel Newmarket 741780

SWAP INCA CURSE (48K Spectrum) and 3D-Tenx or cruising for any of level 9s adventures 61 Bryngwyn Road Dafen LLanelli Dyfed South Wales Tel (05542) 78158 after 4 pm

SWAP MY ATARI 800 32K with Basic, recorder joysticks, keyboard books and software plus £200 racer for Commodore 64 and disk drive other swaps considered Tel ????

WANTED 48K SPECTRUM and tape recorder Write to J R O Trevor Eves Alpha 28 Kelly Squadron HMS Mercury Leydene Petersfield Hants

SWAP PIRATE COVE and Mission Impossible for any other Scott Adams adventure game series Tel 0864 471097

SWAP CB microphone SWR matcher walkie talkie voice controller toy van and radio controlled robot for any good computer and accessories except ZX81 Ace Write with your offer to Alan Jones 33 Bishop Road Ammanford Dyfed SA18 3HB

WANTED ZX81 for beginner nothing fancy wanted some software but not essential Phone after 6 pm 031 336 4372

SPECTRUM 16K wanted Tel Leigh Valley (0502) 715662

SPECTRUM SOFTWARE for swap Black Crystal Horace Goes Skiing Planet of Death and later adventure and arcade games Phone Andy on Melton Mowbray 62644

SPECTRUM SOFTWARE to swap Black Crystal Do Not Pass Go High Noon others or will sell! Send your list to Keith Burton 6 Westbourne Terrace Barnsley South Yorkshire S70 6HP

SWAP VIC20 Dotman and Pirate Cove adventure cartridge and games book for 16K Ram pack (will swap separated) Tel (0743) 65248 evenings

SWAP SPECTRUM SOFTWARE M coder 16-48 K Ant Attack 48K or English Literature 16-48K Phone Bristol (0272) 588599 ask for Nick

WANTED FOR ZX81 Black and white TV (portable) Tel 01 298 0775

SWAP MOON BASE ALPHA and Catcha Snatcha for two other cassettes or one cartridge Roy Astamewicz, 1 Drake Croft Smithfield Rise Lichfield Staffs WS13 6SE

WANTED U S Spectrum or WHY Must all complete and cheap Telephone Abingdon 834613

SWAP RADOFIN COLOUR TV GAME with four cartridges for ZX Spectrum 1 Stanley Street Lower Pilsley nr Chesterfield Derbyshire Tel 853144

SWAP ZX81 and 16K RAM with all leads and manual for ZX printer with paper or sell for £30 Tel 458 8698

SWAP PIRATE COVE (Vic20) for Mission Impossible Voodoo Castle or The Count Phone 0621 741321 between 6 and 9 pm ask for Ian

COMMODORE 64 cassette unit needed will pay £15 Tel 0689 270920 (Weston) nr Stafford

WANTED ZX81 and accessories working or not working Tel 01-692 0489 (Ian)

WANTED 48K Spectrum will pay £60-£70 Harpenden 89152

WANTED BBC software to swap Harpenden 89152

Tandys for sale

BBC ORIGINAL SOFTWARE to sell or swap games educational and business all wanted Tel 051 420 3488 evenings

TANDY TRS80 machine one level two 16K memory Expansion interface unit with 16K memory disk drive 5¼in Ram disc 5 Seikosha GP 1004 Printer a bulk eraser Offers for all or individual items 0688 40440

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VIDEO GENIE II 16K, software— three games editor assemble monitor toolkit, £240 Tel Hull 48471

VIDEO GENIE Level II 16K, built-in tape recorder sound and joystick, tapes £140 ono Tel 0245 465262

TANDY MODEL 100 portable computer £900 Tel 0455 611479 Mr Bradshaw

TANDY CGP 115 Colour Graphic Plotter Printer + new pens + two new rolls of paper £125 ono Also Dragon to Centronics Printer cable £12 Tel Northampton (0604) 28319 evenings Ask for Devol

TANDY CGP 115 Colour Graphic Printer Plotter plus connection lead for Dragon 32 £105 Tel Trevor Walton 881031

APPLE II COMPUTER 48K £200 Tel 01 551 2987 (any time)

VIDEO GENIE with £250 of software books and magazines £180 ono Tel 0275 822145 (Bristol)

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ACORN ATOM 12K Ram 12K Rom television Guaranteed PSU leads of software ie Astrokinid etc magazines worth £300 sell for £110 ono Tel 01-840 5375 anytime

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BBC MODEL "B" with disc interface wordwise 1 2 Rom excellent condition £450 ono Acorn teletext adapter brand new £200 View word processor with printer driver cassette £50 Deliver in Kent Tel 0227 750600

BBC MODEL A plus Epsom printer £100 worth of software worth £470 quick sale £180 Tel Hornchurch 57581 after 6 pm

ACORN ATOM 12K in BBC Basic cassette player £25 software manuals leads £45 or swap for Sinclair computer and software Tel Hesketh Bank Lancs Tel 077473 4958

BBC MODEL B, complete with much software including Meteors Killer Gorilla Defender and many more Also one book. 1 2 OS bargain at £370 Tel 01 391 4085 after 5 pm

BBC MICRO MODEL A, as new including five BBC software programs + soft cover + two books £260 Tel Blackburn 672603 (after 8 pm)

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BBC MODEL B disc drive interface Modem Wordwise Disc Doctor blank discs and disc software total cost £1 140 Will sell for for £250 Tel 01 205 2174 or 205 3024 and ask for Benjamin

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For sale

TRS 80 16K extended basic colour computer + manuals joysticks leads and cassette games worth £420 accept £210 as new condition Tel 07737 69726

BINATONE TV GAME and instructions £6 computer magazines £40 worth for £15 including Your Computer and CVG Write to Mr D Appleton 9 Coronation Road Highbridge Somerset TA9 3DX

BBC MODEL B 1.2OS BASIC 2 with joysticks light pen and digitiser and lots of software very good condition must sell due to immigration cost £600 sell £220 Tel Philip Hornchurch 51045

SHARP MZ80K 48K Basic 18 months old as new boxed with user manuals £200 ono Telephone Kettering 761894

VIC20 mother board 2 joysticks light pen £1 500 software sell £300 Phone 01-840 3610 after 5 pm

POCKET COMPUTER Sharp PC 1211 1.4K memory 3 manuals and cassette interface suit beginner or businessman £40 Write to 24 Raby Street Ormeau Road Belfast BT7 2GY (enclosing telephone number)

ZX81 SOFTWARE FOR SALE Creeke Crawler at £2.50 machine coder at £3.50 Telephone Stannington 415 after 6 pm

FOR SALE ZX 1.2A power pack for the ZX81 and printer never been used and boxed £4 including p&p Tel James Main on 0427 880116

SHARP MZ80K, comes with the manual + 2 programming books and £250 worth of software and all for just £450 all new software Tel 01-465 9841 after 4.15

ATARI 400 — 48K 810 DD 410 recorder games + extras + books. Boxed accept £450 ono Call Redhill 61612 evenings

ORIC 48K with software and case £130 Phone Weybridge 41469

MICROTAN 65 with Tanex 32K Tan ram Hi-Res toolkit tapes and manual £250 could split Tel Weston-super Mare 413081

DRAGON 32, under guarantee software joysticks magazines worth £100 £225 ono Tel Tadworth 3349

ATARI VCS, mint condition complete with paddles joysticks 10 cartridges £180 Tel Bagend (0278) 73278 before 8 pm Mr Brennan

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LYNX 48K immaculate still under guarantee plus book and three games including Colossal Adventure £175 Tel 680 2857 evenings 735 4481 ext 48 office

ORIGINAL SOFTWARE FOR SALE £4 each Tel Newcastle 581521

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TRS80 16K extended Basic colour computer manuals all leads two joysticks and 3 games £250 Tel 07737 69726

PET 32K Basic 3 cassette player green screen over 100 cassettes disk-o-pro chip serviced in the last month £300 ono Tel 388 6963

ORIC 1 48K + £70 of software 1 book on the Oric 2 Oric owner magazines + cassette leads worth £210 £130 ono Telephone Mark after 4 pm Hornchurch 69552

SWAP 48K Lynx with some software + books £200 ono Tel Worthing 42121 after 6 pm

SHARP MZ80K computer 48K in excellent condition hardly used over 150 games and utilities, £325 Tel Bexleyheath (01) 303 4173 evenings only

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APPLE II PLUS includes disk drive + b/w monitor for sale or bargain exchange with BBC Model B system Tel Kings Winford 271753 (school) or Wolverhampton 330527 (after 6 pm)

LARGE NUMBER of used software for BBC Model B and Dragon 32 will sell for half price or will swap Ring Paul on 061-205 0679 (after 5 pm)

LYNX 48K, as new still under guarantee sale case plus three cassettes including Colossal Adventure £175 Tel 680 2867 (eves) 736 4881 ext 69 (days)

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APPLE II for sale very cheap £450 + software Guaranteed still normal price 01-574 1655 4-6 pm

ATARI VCS plus Combat, excellent condition only one year old £40 Tel John 01 267 0434 between 5 pm and 6 pm

APPLE SILENTYPE PRINTER + interface card as new £150 Tel Basingstoke 54488

VICSON SWITCHABLE 16K, Commodore 8K and cartridges for sale Tel 0442 56900

ATARI VCS cartridges £5—£15 each bargain price Tel 907 3984

ZX81 PACK of three books four tapes and print and plotter joust ideal for first-time user £10 the lot Tel Burnley (0282) 20244 after 5 pm

INTELLIVISION + 4 cassettes £75 Tel 01-488 4914

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ZX PRINTER, five months old + 8 rolls of paper cost £58 will sell for £48 Tel 0902 891913 (ask for Philip) The buyer collects

SHARP PC3201, 64K dual disc drive printer monitor £1 250 ono 01 962 4936

VIC20 SUPER EXPANDER for sale also Gorf Adventureland Lunar Land or Road Race and Rat Race cartridges for sale Tel 01 460 3171 after 5 pm.

VIC20 C2N cassette unit, Vixen switchable 16K Ram Quickshot joystick tape software worth about £1 200 (around 160 games) only few months old bargain at only £300 Phone 01 460 3171 for details

COMPLETE VIC20 computer for sale except for printer Offers. Tel 05432 53344

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SHARP MJH 80A, £300 ono or exchange for BBC Model B Tel. 0442 42487

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ZX PRINTER with 8 rolls of paper £20 15 cassettes mainly games £30 Tel 01 574 4122

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32K MEMORY ADD-ON BOARD for Model 1 Spectrum 16K £20 Kempston joystick interface £8 Call Gerrards Cross 887771

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ZX81 16K RAM PACK, £8 Tel Saffron Walden 27752


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The smooth control of a Voltmace DELTA sprung return joystick is now available to Dragon owners. Called the DELTA 3D it is a cut down version of our DELTA 14B handset. The same robust ball and socket jointed joystick but with the keypad blanked off to leave a choice of one of three fire buttons.
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CHESHAM
BUCKINGHAMSHIRE
ENGLAND

CIRCUIT BREAK



Nice idea for a game this, *Transistor's Revenge* is a high speed 'bettle it out' program set inside your beloved BBC B

The CPU, all knowing all seeing, heart of your machine, is threatened by the envious glances of other, lesser components — revolution is in the air and down the solder tracks they are rushing ever-onward

Your task is to repel the usurpers by firing pulses of electricity down the appropriate track It's finger twitching stuff trying to get to the right track in time

Limited help is at hand in the form of useful household tools that appear at the edge of the circuit — hit them for bonuses An excellent idea well executed — what more could you ask for?

Program *Transistor's Revenge*
Price *£6 95*
Micro *BBC B (A with 32K and 6522)*
Supplier *Softspot*
29 South Crescent
Prittlewell
Southend SS2 6TB

ET TU BRUTE?

Caesar the Cat is the first arcade game from Mirrorsoft, the software house spin-off from the famous tabloid

The game is wonderful, with some of the best graphics yet seen on the Commodore 64 Caesar himself is so beautifully animated only the most stoney hearted could fail to yield a sigh of delight

But enough of this twee stuff Caesar is a working cat and as such his task is to rid the larder of various mice that are devouring its contents

You move Caesar from shelf to shelf trying to catch the mice, but being careful not to knock over the various valuable ornaments that are also (rather stupidly) kept there

A marvellous, truely addictive game which also manages to be original, it has few peers Oh yea, the soundtrack music is great too

Program *Caesar The Cat*
Price *£8 95*
Micro *Commodore 64*
Supplier *Mirrorsoft*
The Mirror Group
Holborn Circus
London EC1P 1DO

SPEEDWAY STAR

Micromega's *Luna Crabs* was a high quality 3D program that should have sold well

The author of *Luna Crabs* M J Escourt has now released a follow-up called *Death Chase* Basically this uses the same 3D techniques in a bike race game

You can just see the front of your bike and, from the distance, rushing towards you, various trees, the 3D effect being used very convincingly to create the illusion of swerving through a dense forest

Your bike is armed with photon guns (it would not, therefore, get a licence) and there are various baddie objects for you to obliterate It's exciting stuff very well done

Program *Deathchase*
Price *£6 95*
Micro *Spectrum 48K*
Supplier *Micromega*
230-236 Lavender Hill
London SW11 1LE

WRATH OF KARN

White Crystal is a graphic adventure game without text If that sounds odd, just imagine an arcade game that takes a while to play and is chock full of adventure ideas

The game, for the Dragon 32, places you in the world of the Karn — gentle wizards who walked the earth 10,000 years before mankind existed

Naturally, were this happy state to have remained, *White Crystal* would not be much of a game (can you walk around the world with the gentle wizards? — an all action wander Not too catchy, but thence came Scard Lord of the Night

You must enter the pits of Karn and ascend various ladders collect items like food, gold and a sword with which to smash the white crystal (source of Scard's power) If you can master all the screens of ladders without getting blasted by Scard's Laser, you will eventually come across the crystal itself

Program *White Crystal*
Price *£6 99*
Micro *Dragon 32*
Supplier *Romik Software*
272 Argyll Avenue
Slough Berks

MERGATROIDS



Abacus Software has returned after what appears to be months of silence with four new games for the Spectrum

Munnery's Mergatroids is a 3D space shoot out The plot is simple — kill everything in sight There are five different kinds of alien and seven zones through which you must pass

Like some of Artic's 3D efforts the aliens are drawn in hi-res outline only — imagine a sort of *Asteroids* as seen from the vantage point of the spacecraft

It looks quite impressive but I found the 3D fairly baffling — I got confused as to how

SMAUG JOINS THE BEEB

The Hobbit is now available on the BBC The game which until the advent of *Valhalla* was considered the ultimate adventure game on the Spectrum has been adapted for a number of other micros.

I doubt that there is much point in my summarising the game, except to say that it is a superb adventure with marvellous graphics — it has assumed the status of a cult on the Spectrum

Perhaps it's worth a passing word or two on the various versions available All are excellent but, curiously enough, the BBC one is not one of the best — the Spectrum one is far better Why?

The reason, simply enough, is that despite the fact that the BBC B has lots of ports and a real keyboard and is the love of the DoE's life, it doesn't actually have as much memory as the Spectrum Consequently, there is less room for the graphics Mull that situation over for a while

Ponder also the fact that all the most innovative stuff crops up first on the Spectrum (how long before the first non Spectrum version (Commodore 64 I would guess) of *Valhalla* turns up — four or five months at least, I'll bet) — Why?

Program *The Hobbit*
Price *£14 95*
Micro *BBC B*
Supplier *Melbourne House*
131 Trafalgar Road
London SE10

near the baddies were consequently I am unable to describe the later levels of the game

Program *Munnery's Mergatroids*
Price *£5.50*
Micro *Spectrum 48K*
Supplier *Abacus Programs, 716 Llangyfelach Road, Tredoeth, Swansea SA5 9EL*

BATTERED FROG

Releasing yet another Spectrum version of *Frogger* is either foolishness or confidence. I assume here that it is the latter since PSS has not, in the past, offered much evidence of insanity

The game has all the features of the arcade original including the neat touch of an ambulance which rushes up to take your battered frog to hospital after he is splattered by some car or truck

Other than that, it's very much like all the other versions of the game. In fact it bears a curious resemblance to one which was published in *Your Computer* several months ago. The same author?

Program *Hopper*
Price *£6.95*
Micro *Spectrum*
Supplier *Personal Software Services, 452 Stoney Stanton Road, Coventry CV6 5DG*

COTTON SOCKS

Espionage is a straightforward text adventure written in Basic for the Dragon 32

Ordinarily that would be enough for me to cast the game away forever, but the plot has a few nice touches

For one thing you are a baddie a commie infiltrator, redder than red right down to your little cotton socks

Hoping to spread your evil creed across the democratic face of the western alliance you have been set the task of entering GCHQ undetected (I should apply for a job there, that's how everybody else does it) Once in you must find a list of western agents and get out safely Karla will love it.

Program *Espionage*
Price *£4.95*
Micro *Dragon 32*
Supplier *Exodus Software, 36 Peunce Drive, Tividale, Warley, West Midlands B69 1UQ*

HIDDEN WORDS

Word Feud is a puzzle program for the Commodore 64 Based closely on the popular word puzzles your task is to discover a hidden word within a screenful of jumbled letters

The two-player version involves moving windows around the screen to be the first to find the hidden word Because of the computer might accidentally throw up meaningful words where none were intended, all the hidden ones are paired — both must be found

Program *Word Feud*
Price *£7.95*
Micro *Commodore 64*
Supplier *Audiogenic, PO Box 88, Reading, Berks*

3D SHAPES

Graphics Package from Dream Software is a useful utility for the Oric and Spectrum

Although there are a number of similar packages available for both machines this one does seem to have a few more features than most

Aside from the usual options for cursor movement change colours, fill in and the like, there are routines to construct simple 3D shapes like cubes and rectangles The program, which comes with an instruction booklet, retails for a very reasonable £4.50

Program *Graphics Package*
Price *£4.50*
Micro *Spectrum/Oric (48K)*
Supplier *Dream Software, PO Box 64, Basingstoke, Hants*

GENTLE INTRO

Pawn Chess is a gentle introduction to one aspect of conventional chess as well as a useful way for experienced chess players to improve their pawn game

As the name suggests, the game is simply chess played only with pawns The all machine code program calculates its moves in one fifth of a second, so no tedious waiting for a response

The game also features an on screen clock for timing and includes a history of chess

Program *Pawn Chess*
Price *£4.95*
Micro *Spectrum 48K*
Supplier *Contrast Software, Farnham Road, West Liss, Hants GU33 6JU*

BIRDMEN

Program Power is one of the top five BBC houses Not surprising then that they should start to adapt their games to run on the Electron

Swoop is a good quality version of *Galaxians* and indeed all those other arcade games that feature wave upon wave of baddies battering a laser base

In this case you must fight off swooping birdmen who attack in eight phases, each more difficult than the last — can your nerves stand it?

Program *Swoop*
Price *£7.95*
Micro *Electron*
Supplier *Micro Power, 8/8a Regent Street, Chapel Allerton, Leeds LS7 4PE*

VICIOUS BATS

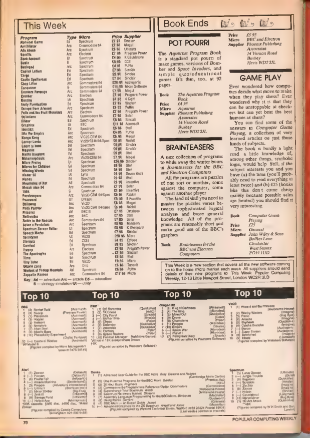
Transylvanian Tower is probably the most successful of all Richard Shepherd's adventure games — it was in the Spectrum charts regularly for several weeks

The game is now available on the Dragon 32 Aim of the game is to find your way through a tower picking up useful objects as you go to your ultimate objective — to kill Count Dracula

The game uses a *'hunt the Wumpus'* format — simple 3D graphics draw the rooms in the tower and you must memorise a map to successfully find your way through to the exit on each level The later levels include vicious vampire bats who can suck your blood Very creepy

Program *Transylvanian Tower*
Price *£6.50*
Micro *Dragon 32*
Supplier *Richard Sheperd Software, Elm House, 23-25 Elmshott Lane, Cippenham, Slough, Berks*

New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12-13 Little Newport Street London WC2R 3LD



This Week

Program	Type	Micro	Price	Supplier
Alphabet Game	Ed	Spectrum	£7 95	Sinclair
Annihilator	Arc	Commodore 64	£7 95	Mogul
Atic Atac	Arc	Spectrum	£5 95	Ultimate
Bandits	Arc	Electron	£7 95	Program Power
Bank Account	Ut	Spectrum	£4 00	K Gouldstone
Battle	S	Spectrum	£5 95	CCS
Besieged	Arc	Spectrum	£4 95	Puffin
Capital Letters	Ed	Spectrum	£7 95	Sinclair
Cargo	Ed	Spectrum	£9 95	Sinclair
Castle Spellerous	Ed	Spectrum	£7 95	Sinclair
Chop Lifter	Arc	Commodore 64	£20 95	Audiogenic
Conqueror	S	Commodore 64	£15 95	Micro Software
Creators Revenge	Arc	Commodore 64	£7 95	Mogul
Cranker	Arc	Electron	£7 95	Program Power
Destiny	Ut	Spectrum	£4 95	4 Sight
Early Punctuation	Ed	Spectrum	£7 95	Sinclair
Escape from Arkaron	Arc	Spectrum	£4 95	Puffin
Felix and the Fruit Monsters	Arc	Electron	£7 95	Program Power
Galaxians	Arc	Commodore 64	£7 95	Solar
Glider	Ed	Spectrum	£9 95	Sinclair
Graphics	Ut	BBC	£11 95	Acornsoft
Identikit	Ed	Spectrum	£5 95	Stell
Into the Empire	Arc	Spectrum	£4 95	Puffin
Kongo Kong	Arc	VIC20/CBM 64	£6 95	Mogul
Lancer Lords	Arc	Vic20/CBM 64/Spec	£6 95	Rabbit
Learn to Read	Ed	Spectrum	£9 95	Sinclair
Magnets	Ed	Spectrum	£9 95	Sinclair
Maths Invaders	Ed	Spectrum	£6 95	Stell
Metamorphosis	Arc	Vic20/CBM 64	£7 95	Mogul
Micro-Prolog	Ut	Spectrum	£24 95	Sinclair
Micros for Children	Ed	Spectrum	£6 95	Stell
Missing Words	Ed	Spectrum	£6 95	Stell
Moder 96	Ut	Lynx	£6 95	Seven Skill
Money	Ed	Spectrum	£6 95	Stell
Mountains of Ket	Ad	Spectrum	£5 95	Incentive
Mouch man 64	Arc	Commodore 64	£7 95	Solar
1984	S	Spectrum	£5 95	Incentive
Paratroopers	Arc	Vic20/CBM 64/Spec	£5 95	Rabbit
Password	UT	Dragon	£5 00	B Franklin
Pollywog	Arc	Vic20	£6 95	Mogul
Potty Painter	Arc	Vic20 CBM 64/Spec	£5 95	Rabbit
Prisoner	Ad	BBC B	£7 95	Database
Rollrunner	Arc	BBC	£7 95	Stell
Robin to the Rescue	Arc	Commodore 64	£7 95	Solar
Satan s Pendulum	Arc	Spectrum	£5 95	Mikrotron
Spectrum Screen Editor	Ut	Spectrum	£5 95	K Sheppard
Speech Marks	Ed	Spectrum	£7 95	Sinclair
Sprintyper	Ut	Vic20	£20 95	Micro
Starquiz	Ed	ZX81	£4 95	Eclipse
Survival	Ed	Spectrum	£9 95	Sinclair
Swoop	Arc	Electron	£7 95	Program Power
The Apostrophe	Ed	Spectrum	£7 95	Sinclair
Time	Ed	Spectrum	£6 95	Stell
Tiny Tutor	Ed	Vic20	£9 95	Micro
Urbane Zone	Arc	Oric	£5 95	Tansoft
Warlock of Firetop Mountain	Ad	Spectrum	£6 95	Puffin
Zeppelin Rescue	Arc	Commodore 64	£17 95	Micro

Key **Ad** — adventure **Arc** — arcade **Ed** — education
S — strategy-simulation **Ut** — utility

Book Ends

POT POURRI

The *Aquarius Program Book* is a standard pot pourri of maze games, versions of *Bomber* and *Space Invaders*, and simple quiz/educational games It's thin, too, at 92 pages.

Book *The Aquarius Program Book*
Price *£4 95*
Micro *Aquarius*
Supplier *Phoenix Publishing Associates, 14 Vernon Road, Bushey, Herts WD2 2JL*

BRAINTEASERS

A nice collection of programs to while away the winter hours in *Brainteasers for the BBC and Electron Computers*

All the programs are puzzles of one sort or another, some against the computer, some against another player

The kind of skill you need to master the puzzles varies between sophisticated logical analysis and basic general knowledge All of the programs are reasonably short and make good use of the BBC's graphics

Book *Brainteasers for the BBC and Electron Computers*
Price *£5 95*
Micro *BBC and Electron*
Supplier *Phoenix Publishing Associates, 14 Vernon Road, Bushey, Herts WD2 2JL*

GAME PLAY

Ever wondered how computers decide what move to make when they play chess? Ever wondered why it is that they can be unstoppable at checkers but can yet beat the best humans at chess?

You can find some of the answers in *Computer Game Playing*, a collection of very learned articles on just these kinds of subjects.

The book is hardly a light read a little knowledge of, among other things, symbolic logic, would help Still, if the subject interests you and you have (a) the time (you'll probably need to read everything at least twice) and (b) £25 (books like this don t come cheap mainly because possible sales are limited) you should find it very interesting

Book *Computer Game Playing*
Price *£25*
Micro *General*
Supplier *John Wiley & Sons, Baffins Lane, Chichester, West Sussex PO19 1UD*

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to This Week Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD

Top 10

BBC
1 (2) Rocket Raid (Acornsoft)
2 (4) Swoop (Program Power)
3 (1) Planetoids (Acornsoft)
4 (3) Hopper (Acornsoft)
5 (5) Meteors (Acornsoft)
6 (6) Monsters (Acornsoft)
7 (7) Alien Swirl (Acornsoft)
8 (8) Missile Base (Acornsoft)
9 (10) Feasibility Experiment (Digital Fantasia)
10 (—) Castle of Riddles (Acornsoft)
All Model B
(Figures compiled by Micro Management Ipswich 0473 59181)

ZX81
1 (1) QS Scramble (Quicksilva)
2 (2) 1K Chess (Artic)†
3 (—) City Patrol (Sinclair)
4 (—) Mothership (Sinclair)
5 (6) Chess (Psion)
6 (8) Defender (Quicksilva)
7 (7) Asteroids (Quicksilva)
8 (3) Fantasy (Psion)
9 (5) Space Raiders (Psion)
10 (10) Football Manager (Addictive Games)
*All run in 16K except where shown
†1K
(Figures compiled by Websters Software)

Dragon 32
1 (5) Ring of Darkness (Wintersoft)
2 (4) The King (Microdeal)
3 (3) Mined Out (Quicksilva)
4 (8) Drone (Cable)
5 (6) Champions (Peaksoft)
6 (1) Frogger (Microdeal)
7 (10) Empire (Shards)
8 (—) Space War (Microdeal)
9 (—) Planet 1 (Microdeal)
10 (7) Pettigrews Diary (Shards)
(Figures compiled by [illegible] Software)

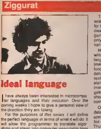
Vic20
1 (1) Wizard and the Princess (Melbourne House)
2 (2) Wacky Waiters (Imagine)
3 (3) Panic (Bug Byte)
4 (6) Arcadia (Imagine)
5 (5) Skyhawk (Quicksilva)
6 (4) Catcha Snatcha (Imagine)
7 (—) [illegible] (Audiogenic)
8 (—) Super Screen (Audiogenic)
9 (8) Bewitched (Imagine)
10 (5) Mindi (Llamasoft)
(Figures compiled by Websters Software)

Atari
1 (1) Zaxxon (Datasoft)
2 (—) Pooyan (Datasoft)†
3 (8) Planetfall (Infocom)†
4 (—) Arcade Machine (Broderbund)‡
5 (5) Preppie (Adventure International)
6 (—) Ultima II (Sierra on line)‡
7 (3) Miner 2049er (Big Five)
8 (—) Zork III (Infocom)§
9 (9) Savage Pond (Infocom)†
10 (—) Hellcat Ace (Microprose)†
†32K cassette §32K disc ‡48K disc *Miner 2049er
(Figures compiled by Calisto Computers Birmingham 021-632 6458)

Books
1 (1) Advanced User Guide for the BBC Micro *Bray Dickens and Holmes* (Cambridge Micro Centre)
2 (5) One Hundred Programs for the BBC Micro *Gordon* (Prentice-Hall)
3 (3) 30 Hour Basic *Prigmore* (NEC)
4 (2) Commodore 64 Programmers Reference Guide *Commodore* (Commodore)
5 (4) Supercharge Your Spectrum *Webb* (Melbourne House)
6 (6) Spectrum Hardware Manual *Dickens* (Melbourne House)
7 (7) Assembly Language Programming for the BBC Micro *Birnbaum* (Macmillan)
8 (8) Using the 64 *Gerrard* (Duckworth)
9 (9) BBC Micro — an Expert Guide *James* (Granada)
10 (—) Advanced Graphics for the ZX Spectrum *Angell and Jones* (Macmillan)
(Figures compiled by Watford Technical Books, Watford 0923 23324 Prestel 89828)
(Last week s position in brackets)

Spectrum
1 (3) Lunar Jetman (Ultimate)
2 (—) Jungle Trouble (Durell)
3 (6) Bugaboo (Quicksilva)
4 (—) Scrabble (Sinclair)
5 (—) Zip Zap (Imagine)
6 (8) Zzoom (Imagine)
7 (—) [illegible] (Sinclair)
8 (—) Countabout (Longman)
9 (10) Manic Miner (Bug Byte)
10 (1) 3D Ant Attack (Quicksilva)
**48K
(Figures compiled by W H Smith and Son, London)

Ziggurat



Ideal language

I have always been interested in microcomputer languages and their evolution. Over the coming weeks I hope to give a personal view of the direction they are taking.

For the purposes of this series I will define the perfect language in terms of what it will do. It will allow the programmer to translate algorithms and ideas into computer executable form with the minimum of effort, maximum speed of execution and in such a way that the program is understandable to other readers.

This week I'll examine how far Forth comes to reaching these ideals. In case I offend any Forth fanatics I should point out that I am searching for an ideal language which does not exist so just about every language will come in for criticism. The threaded interpretive concept is undoubtedly elegant but I can only see two distinct advantages: speed and compactness. However, a decent compiler for another high level language should be able to exceed Forth's speed mostly due to the overhead attached to each Forth word.

Forth is not particularly compact if you include the source code to a word. In addition, since the identifier linked to each word is stored in the object code, it is far longer than needed.

The most pertinent objections to Forth are the impenetrability of source code and the use of reverse polish notation. I am not too bothered about it being difficult to learn, because I will always maintain that a thing can be hard to learn but easy to use.

The unreadability of source programs seems to be due to the odd names given to words, which is a quirk of history, and to the use of reverse polish notation. I imagine Forth uses RPN to allow efficient programs to be written. However, nowadays many properly written compilers will generate code at least as efficient.

To sum up, Forth appears to have been written to get around the lack of good compilers for better languages — a lack which has since disappeared. Witness the number of arcade games written in Forth purely because it is the only high level language with a decent execution speed.

However, Forth has two valuable features which it would be nice to have in our ideal language: user extensibility and a powerful immediate mode. While it can be argued that functions and procedures (statements) can be defined in Pascal (and BBC Basic), this is not really satisfactory since they are only two of the elements that go to make up programs. The immediate mode cannot be used with all languages but at the very least, the ideal language should be available in both interpretive and compiled forms.

One other bad feature of Forth is the lack of data types. Admittedly though, it is nice in some applications to treat everything as 16 bit words but other applications often require data types. Thus the ideal language should be typed but not as loosely as Forth.

A nice feature is the stack. However, a single stack is not really enough for many graphics and language applications. So lets give our language multiple user defined stacks.

Forth is extremely easy to implement, since only a small part of the language need to be written in the machine language of the host machine. So, it may be a good language in which to write the compiler and interpreter for our new language.

Modern implementations of Forth offer multi-tasking — the execution of more than one set of words at the same time. This concept can be refined for our ideal language. There are at least two ways of implementing multi tasking. One is to have multiple program counters executing different parts of the same program. However, this can cause problems since each program counter needs local variables.

It would probably be quite unwieldy to declare the variables so I am not in favour of this solution. However, in a multi-user application, this method is fine since all variables can be local to a particular program counter. But this does not allow communication between program counters which is necessary for multi tasking. So I am more in favour of implementing multi-tasking by allowing separate programs to run concurrently, sharing data in a defined way such as via an equivalent of the resident integer variables of BBC Basic. ■

Jeremy Ruston

Puzzle

Along the lines

Puzzle No 84

"But it won't do!" exclaimed the prime minister of Primordia as he examined his new telephone number. "It's not prime!"

This domestic disaster highlighted the importance of prime numbers to the citizens of Primordia — a land where such numbers were held in the highest esteem and where it had even been suggested that the Primordian year should consist of 367 days in order that it should be prime.

It was the chancellor of the exchequer that came to the rescue. "On the contrary," he replied. "Your new number is quite exceptional: each digit is prime — because we allow 1 to be classed as prime; any two adjacent digits also form prime numbers, as do any three consecutive digits and also any four consecutive digits.

In fact, it is the largest number which has this property."

This seemed to satisfy the prime minister who, much mollified, agreed to keep his new number.

What was his new telephone number?

Solution to Puzzle No 79

The program finds the total number of pages N by looping, adding one to N each time. A running total of the number of pieces of type used is kept by T.

When both N and T are perfect squares they are printed out.

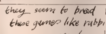
```
10 LET T = 0 20 LET N = 1 30 LET N$ = STR$ N 40
LET T = T + LEN N$ 50 LET S = VAL STR$ (SQR T)
60 LET P = VAL STR$ (SQR N) 70 IF S - INT S = 0
AND P - INT P = 0 THEN PRINT N T 80 LET N = N
+ 1 90 GOTO 30
```

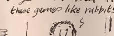
After $N = 144$, the next possible set of values is $N = 1089$ and $T = 3249$. After that, $N = 8649$ and $T = 33489$.

A book of 8649 pages is a very large title indeed so the correct answer is a book of 1089 pages (33^2), which needed 3249 pieces of type (57^2) to number it.

Winner of Puzzle No 79

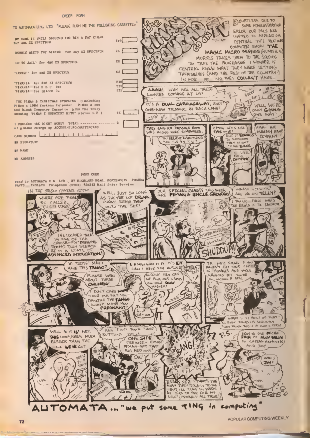
The winner is D Bell, Swannells Wood, Studham, Beds, who receives £10.










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the PIMAN & GROUCHO GO ON TV
DOUBTLESS DUE TO SOME ADMINISTRATIVE ERROR OUR PALS ARE INVITED TO APPEAR ON CENTRAL TV'S TEATIME COMPUTER SHOW THE MAGIC MICRO MISSION (NUMBER 5) MORRIS TAKES THEM TO THE STUDIOS TO TAPE THE PROGRAMME I WONDER IF CENTRAL KNEW WHAT THEY WERE LETTING THEMSELVES (AND THE REST OF THE COUNTRY!) IN FOR NO NO THEY COULDN'T HAVE
AAGH! WHY ARE ALL THESE LOONIES COMING AT US?
IT'S A DUAL CARRIAGEWAY, IDIOT! ONE-WAY TRAFFIC IN EACH LANE!
WELL WE'RE ONLY GOING ONE WAY!
THEY SAID OUR DRESSING ROOM WAS ALONG HERE SOMEWHERE.
YOU BELIEVE EVERYTHING YOU SEE ON T.V.?
C'MON LET'S USE THIS ONE!
BUT IT BELONGS TO SOMEONE THEY MIGHT COME BACK
WELL HE'S COMPANY
UMH. WE ALREADY HAVE COMPANY!
IN THE STUDIO CONTROL ROOM
WHERE ARE THOSE SO CALLED GUEST STARS?
I'VE LOCATED THEM IN ONE OF THE CROSSROADS' DRESSING ROOMS! THEY SEEM TO BE IN A STATE OF ADVANCED INTOXICATION!
WELL, JUST SO LONG AS THEY'RE NOT DRUNK OKAY BEAM THEM ONTO THE SET!
OUR SPECIAL GUESTS THIS WEEK ARE PIMAN & UNCLE GROUCHO!
BOO!
NEVERAIARUUUM
SWIZZLE
SHUDDUP!!
I THINK THEW WHO'S THE BROAD IN THE BACOFOIL
HI TOOTS! MAY I HAVE THIS TANGO?
PLEASE WHAT ABOUT THESE CHILDREN?
I DON'T CARE WHAT YOUR MA TOLD YOU DANCING THE TANGO WON'T MAKE YOU PREGNANT!
I KNOW WHO IT IS IT'S ET CAN I HAVE YOU AUTOGR
GOTCHA! HEY CAN WE PLUG OUR GAMES ON YOUR SHOW MISTER?
GULP ER-UM
WHAT'S HE POINT OF THAT? NOBODY TAKES US SERIOUSLY THEY THINK THIS IS A COMIC STRIP
WELL SO IT IS! HEY, THIS COMPUTER'S MUCH BIGGER THAN THE NE WE'VE GOT
UM
AAH DON'T TOUCH THOSE BUTTONS YOU'LL
ONE SIDE PEEWEE- C'MON PIMAN-HIT THAT BIG RED ONE!
OW!
DANGER OVERLOAD
BANG!
EVANS SEZ "THAT'S THE WAY THEY TOLD IT TO ME BUT I'LL TUNE IN WEDS AT 5.15 TO SEE FOR MY SELF! (PROBABLY ALL TRUE!)
P.S.
NOW TO THE MICRO FAIR AT ALLY PALLY TO SPREAD HAPPINESS AND JOY!
WHO'S JOY?
Evans
AUTOMATA... "we put some TING in computing"